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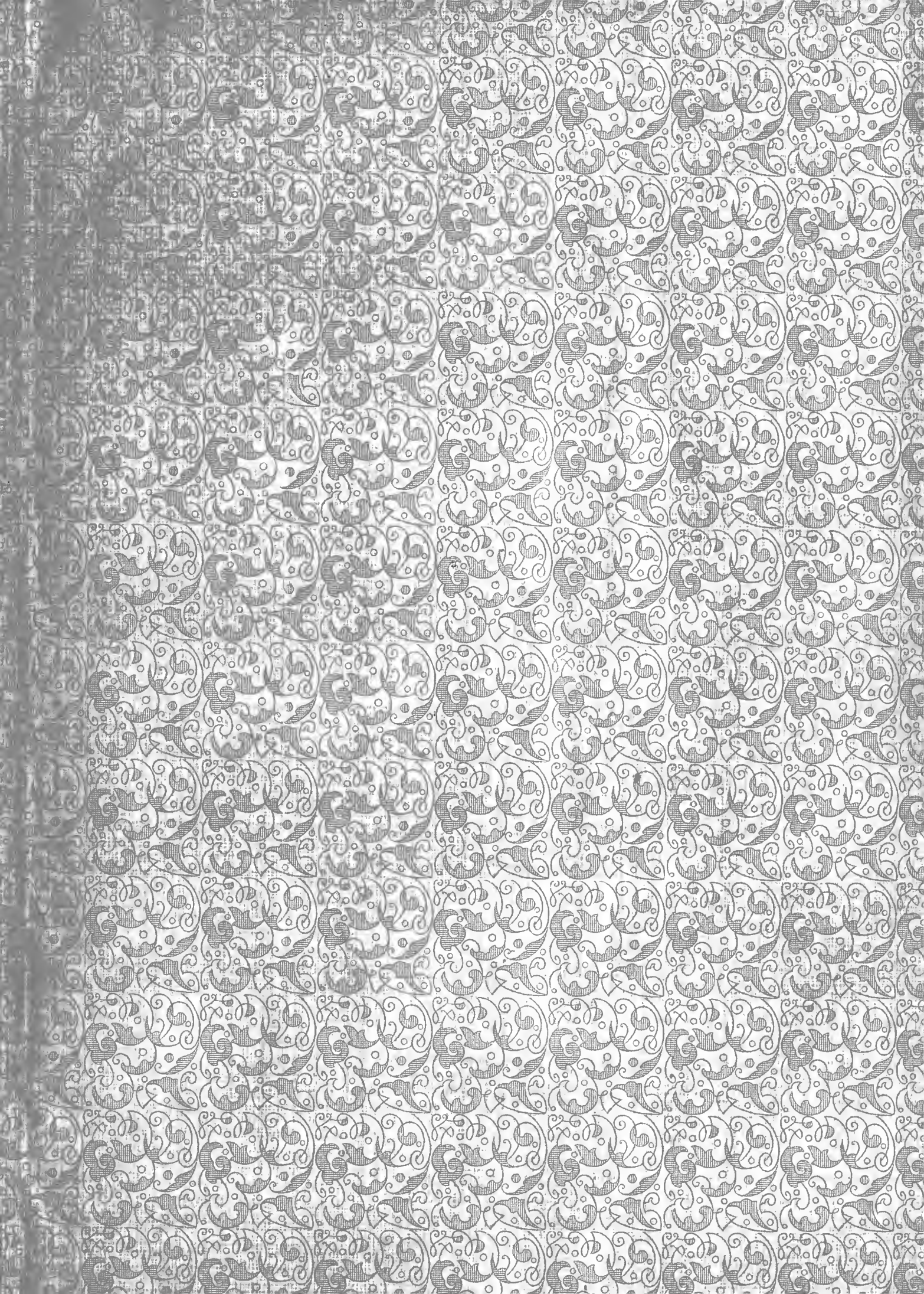
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Index to Volume XXXIX

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Authors' Index

Page	Page
Alvord, R. M. 462	*Lebenbaum, Paul. 266
*Babcock, A. H. 23	*Leibold, C. P. 26
Ballard, R. H. 19	*Leffler, W. S. 14
Barre, H. A. 68, 71	Lemmon, H. A. 165, 206
Barry, J. M. 65	Leonard, A. W. 1
Batchelder, H. S. 15	Levy, Louis. 106
*Bowie, A. 26, 67	*L'Hommedieu, W. P. 20
*Boxall, W. L. 18	*Lighthipe 27, 69
*Bridge, A. F. 22, 25	*Lincoln, P. M. 23, 69
*Brown, L. R. 20	*Lisberger, S. J. 20, 21, 65, 509
*Brownell, John R. 12	Macdonald, J. E. 66
Butts, D. J. 68	*Mateer, Ross B. 52
*Butte, C. F. 17, 100	*McKnight, W. M. 17
*Carr, C. F. 18	McLean, G. B. 14
*Catlin, Hoyt. 60	*McMicken, A. C. 262
Chandler, A. E. 28, 74, 222, 309, 358, 451	*Merrick, C. B. 57, 528
Clausen, John 5	Merwin, L. T. 259
Coldwell, O. B. 305, 413	*Miller, H. B. 211
*Cole, Waldo C. 547	Mongan, Don. 71
Colwell, J. L. 560	Morris, J. W. 515
Coonradt, A. C. 270	*Mulgrew, Mr. 18
*Corbett, L. J. 58	*Murphy, E. C. 549
*Crane 16	*Murphy, F. H. 515
*Crawford, John, Jr. 17, 62, 114, 162	*Northmore, E. R. 20, 66
*Cunningham, R. E. 21, 66, 68	*Palmer, Lillian. 465
Cutten, Charles P. 395	*Peaslee, W. D. 8
Cutting, E. M. 574	*Peirce, H. B. 271
Davis, L. M. 71	*Poole, C. O. 20, 22, 66, 71
Davis, W. J. 69	*Potter, I. B. 21
*Delany, Chas. H., and Robert Sibley	*Prost, H. G. and Wm. K. White. 422, 468, 519, 568
32, 78, 127, 178, 555	Putnam, W. R. 457, 554
226, 274, 313, 363, 405, 453, 504, 555	Quinn, E. A. 69
Deming, W. M. 514, 561	Ralston, J. C. 255
*Downing, P. M. 20, 70	Ranson, Allen E. 357
Duffy, J. L. 259	Reid, H. C. 173
Eltringham, Robt. L. 421	Roche, J. F. 270
*Eskew, W. E. 446	Russell S. P. 70, 71
*Fagan, Frank D. 410	*Schneider, Geo. A. 30, 76,
*Finch, J. W. 2, 356, 498	122, 176, 224, 311, 361, 417, 463, 518, 566
*Furniss, Geo. B. 18	Schwab, Chas. M. 11
Galloway, John D. 350	Scrugham, J. G. 71
*Geibel, Fred. 22	*Sibley, Robt. and Chas. H. Delany
*Grand, L. R. 264	32, 78, 127
Greenawalt, J. F. 302	178, 226, 274, 313, 363, 405, 453, 504, 555
Gribble, W. H. 203	Small, John E. 452
*Grunsky, C. E. 53, 111, 214, 307, 355, 403, 450, 500, 551	*Sorenson, Prof. R. W. 23, 25
Grunsky, Jr., C. E. 214	*Steele, B. L. 267
*Grunsky, Clotilde. 343, 408, 440	*Stewart, C. D. 49
Guest, Edgar A. 326	*Strauch, A. 264
Hall, A. S. 259	*Thompson, Jos. S. 26, 67, 68
*Halloran, A. H. 147, 347, 348, 415, 574	Wade, H. H. 397
*Harding, S. T. 108, 170, 494	*Walton, S. V. 14
Henderson, D. F. 259	*Warren, H. S. 25, 65
Henkle, J. C. 259	*Weber, F. D. 97, 168, 412, 459
Hollis, Ira N. 297	*Weber, F. D. 6
*Holloway, A. E. 14	*Whaley, Ed. 16
*Jackson, H. F. 21, 22	*White, Wm. K. and H. G. Prost
*Jollyman, J. P. 26	422, 468, 519, 568
Jones, E. C. 421	*Williamson, B. A. 443
*Kahn, Sam'l. 16	*Willson, R. A. 264
*Kendall, C. W. 419	Wood, R. J. C. 70
Kennedy, S. M. 270	*Woodbridge, J. E. 19, 20
*Klauber, L. M. 26	21, 22, 23, 24, 25, 26, 27, 65, 67, 68, 69
*Koontz, J. A. 26, 69	*Woodhury, E. 24
Kuhnhausen, A. E. 354	

Illustrated articles are designated by an asterisk (*), editorials by dagger (†)

Illustrated articles are designated by an asterisk (*), editorials by dagger (†)

D	
D.C. Generators, Operation of — by Geo. A. Schneider.....	30
† Dam Design, An Interesting Problem in.....	391
* The Danger of Underrating Overhead Expense—by A. H. Halloran.....	415
Data on the Effect of Resin.....	31
* Daylight Lamps, Successful Use of.....	431
† Decision of Unusual Importance.....	133
Decision on Collisions between Street Cars and Automobiles.....	377
* Delivery Service, Successful Electric Truck	97
* The Delivery Wagon.....	563
* Demand Factor Curve.....	11
* Demand Factors for Motor Feeders— by F. D. Weber.....	459
Deserts Accessible, Making the.....	273
The Deterioration of Western Coal in Storage	404
* Determination of Heating Value of Oils—by Robert Sibley and Chas. H. Delany	555
Developments, New Electrical.....	45, 94, 143, 194, 244, 291, 339, 385, 432, 480, 531,
Direction of Air Flow from Ceiling Fans—by Geo. A. Schneider.....	76
Directory	186
Diversified Problems of Contractor and Dealer	100

	Page		Page		Page
*Doing Business in Guatemala—by J. W. Finch.....	498	Electricity in Russia Now and After the War.....	448	*Fuel Oil Burning, Boiler Room Instructions for—by Robert Sibley and Chas. H. Delany.....	274
*"Doing It Electrically" in the Schools.....	60	Electricity's Service in War Times..	377	*Fuel Oil Economy, a New Advance	49
Don'ts for Sales Bureau, N. E. L. A.	130	*Electricity Supreme in Gold Dredging	104	*Fuel Oil Regulation, A New System of—by Robert Sibley and Chas. H. Delany.....	506
*Dredging, Electricity Supreme in Gold.....	104	ways.....	61	Fuel, Use Water Power and Save..	5
Dutch Auctions, Electric Announcers Used at.....	51	†The Electrification Problem.....	489	*The Fundamentals of Furnace Operation in Fuel Oil Practice—by Robert Sibley and Chas. H. Delany.....	78
E					
Earnings of Western Power Company of Canada.....	576	*Electrification, Whiteson-Corvallis..	200	*Furnace Operation in Fuel Oil Practice, The Fundamentals of—by Robert Sibley and Chas. H. Delany.....	78
Earnings Western States Gas & Electric Company.....	190	Electrifying Railroads in England..	550	*Furnaces in Fuel Oil Practice—by Robert Sibley and Chas. H. Delany.....	363
Earnings of Utah Securities Properties.....	477	†Electro-Chemical Development on Pacific Coast.....	134	Furnishing of Heat, Light and Power	4
*Earth Reservoirs, Reducing Seepage in—by S. T. Harding.....	494	Electro-Chemical Industries, Eastern Rates for.....	202	G	
Eastern Rates for Electro-Chemical Industries.....	202	Electro-Chemical Progress, Review of Recent.....	218	Gains in Utility Earnings.....	239
†Economic Pointer for Tunnel Lining	184	Electro Culture.....	310	Gas and Electricity in the Netherlands, Prices of.....	223
Economizing Electricity in Petrograd	550	†Electro-Metals Installations, Rates for.....	328	Gas Company Denies Competition with Electricity.....	378
*Economy, A New Advance in Fuel Oil.....	49	*Electrolytic Corrosion, Measurement of—by B. A. Williamson.....	443	*Gas Engines, Electric Pumping Replacements of.....	52
*Edison Storage Battery Supply Company.....	579	Elevator Inspection, New Law for..	116	Gas Well Fire, Greatest in History..	130
Edison Sells to Pasadena.....	333	Eltringham, Robt. L.—Letter from..	421	Gems of Salesmanship.....	11
Editorials.....	36, 82, 132, 182, 230, 278, 326, 370, 389, 437, 487,	*An Employment Service.....	507	Generators, Operation of D.C.....	30
†Education Electrical.....	83	Encouraging International Trade..	448	German Owned Patents, Procedure with.....	398
Effect of Losses by Fortuitous Events—by C. E. Grunsky.....	355	Endorsement of the Shield and Walsh Bills.....	333	Germany, Hydroelectric Development in.....	80
The Effect of Mouthpieces on the Flow of Water Through a Submerged Short Pipe.....	346	Engineer and the Commercial Department.....	259	Germany, Power Situation in.....	221
The Effect of Water Power Development on Transportation—by John E. Small.....	452	Engineering and Trade Experts in the Far East, U. S.....	209	*Germany's American Ally.....	324
†Effective Hydroelectric Legislation in Sight.....	438	†Engineering Colleges, Why—Are a Failure.....	488	Gigantic Electrical Equipment for Cantonments.....	61
Efficiency of a Pump.....	261	The Engineering Council—by Ira N. Hollis.....	297	*Gophers in Irrigation Practice, Trapping the.....	216
Electric Activity in Japan.....	117	†Engineering Endeavor, Oriental Money Standards vs.....	84	The Government Does Electrical Advertising.....	354
Electric Announcers Used at Dutch Auctions.....	51	Engineering Expansion Abroad, Commercial and.....	5	Government Nitrate Plants to be Rushed.....	161
*Electric Charging Station at Cristobal Terminal.....	61	†Engineering Growth in China, Commercial and.....	183	Governmental Engineering Positions Open.....	381
*"Electric Heaters Sold Here".....	562	†Engineering in the Pan-Pacific Area	488	*The Gravity of Oils in Fuel Oil Practice—by Robert Sibley and Chas. H. Delany.....	453
Electric Mine Hoist.....	216	Engineering Problems in the West, Present Day.....	19, 65	†Great Awakening in the Northwest	38
†Electric Motor, The Portability of the.....	391	*Engineering Problems, Hyperbolic Analysis for.....	8	Great Value of Electricity.....	71
Electric Motors Sought for Railway in Peru.....	225	†Engineering Relations in the Orient, Commercial and.....	230	Great Western Supplies Service for Football Practice.....	430
Electric Power Development in Utah—by W. R. Putnam.....	554	†Engineers a Necessity, Continued Supply of Young.....	82	Greatest Gas Well Fire in History	130
Electric Power for Mining.....	377	England and the Woman Situation..	467	Group of Motors, Size of Service Wires for a.....	168
Electric Pump, Instance of the Rewards of the.....	167	England, Electrifying Railroads in..	550	Earners.....	466
Electric Pump, New Use for.....	180	England, Extension of Electrical Systems in.....	202	Growth of Engineering and Commercial Relations with Russia....	357
*Electric Pumping Replacements of Gas Engines.....	52	Equipment for Cantonments, Gigantic Electrical.....	61	*Guatemala, A Commercial and Engineering Traveler in—by J. W. Finch.....	356
Electric Railways May Lower Cost of Living, Night Freight Hauling by.....	105	Expansion Abroad, Commercial and Engineering.....	5	*Guatemala, Doing Business in—by J. W. Finch.....	498
Electric Range, Selling the.....	270	Expert Reports on Traction Rate Raises.....	223	Guatemala's Purchases from the United States.....	400
*Electric Ranges Feeder Diversity.....	271	Exposition of Chemical Industries..	87	H	
*Electric Truck Delivery Service, Successful.....	97	Extension of Electrical Systems in England.....	202	Handling Repair Part Orders—by George A. Schneider.....	311
*Electric Water Heating, Recent Progress in.....	264	*Eye Injuries and Their Prevention..	12	Happenings in the Industry.....	189, 237, 238, 285, 333, 377, 476, 526, 575
*Electric Winning of Inspiration		F		Hawaii, Electricity in.....	355
Copper.....	148	Fairbanks Morse Secures Big Sale..	286	*Heat-Insulating Materials, Selection of.....	62, 114, 162
Electrical Activity in Venezuela.....	449	Fair Value and the Rate-Base.....	214	*Heat Insulation, Types of Practical..	62, 114, 162
†Electrical Applications in Ship Building.....	372	Fall Business for the Contractor—by Geo. A. Schneider.....	361	*Heating Value of Oils, Determination of—by Robert Sibley and Chas. H. Delany.....	555
Electrical Christmas Gifts Campaign	332	†False Pride and Patriotism.....	83	Helpful Notes on Interior Telephone Systems—by Geo. A. Schneider....	176
Electrical Contractor's Business, Phases of.....	173	Far East, American Commercial Experts in.....	324	*Helping to Win.....	579
*An Electrical Christmas.....	559	†Far East, Utility Activity in the..	134	†Hetch Hetchy, A Review of.....	372
Electrical Contractors, Standard Code of Practice for.....	565	Far East, U. S. Engineering and Trade Experts in.....	209	Hetch Hetchy Open to Bids, Mammoth Tunnels.....	130
*The Electrical Dealer's Profits—by A. H. Halloran.....	348	Farmer Responding to Advertising..	420	High Lights in Central Station Salesmanship.....	257
†Electrical Education.....	83	Fatigue, British Report on.....	217	High Tension Insulators, Summary of Investigations.....	217
†Electrical Equipment for Temporary Construction Work.....	232	Feeder Diversity of Electric Ranges	271	Higher Positions for Women.....	466
The Electrical Features of a New Ship Industry.....	548	Fees, State and National—for Water Power Projects—by A. E. Chandler	28	Highway Lighting, Silhouette—by S. J. Lisberger.....	509
*Electrical Features of the Campanile Clock.....	546	Female Labor Questionnaire.....	467	Hoist, Electric Mine.....	216
Electrical Meteorological Station....	57	Filaments, Brightness of Tungsten..	10	*The Home Electrical—by Clotilde Grunsky.....	408
*Electrical Monkey Business.....	510	†Financial Status of the West.....	279	*Hong Kong, Electrical Trade with..	448
Electrical Problems Peculiar to the West.....	19, 65	Fire, Greatest Gas Well in History	130	276 Horsepower Added by Pueblo Company.....	239
*Electrical Supply Jobbers' Convention.....	187	*Fire Underwriters, National Board of—Report.....	324	235 Horsepower New Power Business for Richmond.....	239
*Electrical Terms Illustrated: I.....	467	†Fires, Prevention of.....	232	*The Hotels of Japan.....	498
II.....	503	†Flood Light Projectors in Industrial Protection.....	538	Hotpoint Mission Art Window Display.....	332
*Electrical Trade with Hong Kong..	448	*Flood Lighting for Protection.....	540	*How the West is Helping to Win the War: I—Power Development.....	388
Electrical Workers Ask Increase.....	190	Flume and Its Value from an Economical Standpoint, Metal.....	155	II—Ship Building.....	436
*Electricity at the Bunker Hill & Sullivan.....	247	Fog, Seasonal Distribution of.....	64	III—Railway Electrification.....	486
*Electricity at the Utah State Fair—by C. W. Kendall.....	419	Foreign Orders Taken in San Francisco.....	285	IV—Flood Lighting.....	536
Electricity, Great Value of.....	71	Forest Covering and Its Relationship with Stream Flow.....	7		
*Electricity in a Montana Mine.....	497	Fort Smith Gets New Compress....	238		
Electricity in Hawaii.....	355	Fort Cent Car Tickets Discontinued	333		
Electricity on the Farm.....	379, 398	French Ships, Wiring Rules for....	564		
Electricity in the Mines of Alaska—by Allen E. Ranson.....	357	†Fuel and Safeguard the Service, Conserve the.....	37		
		Fuel Calorimeter Tables.....	273		
		†Fuel Costs Affect Pacific Light.....	105		
		*Fuel Oil and Specifications for Purchase—by Robert Sibley and Chas. H. Delany.....	226		
		*Fuel Oil and Steam Engineering... 178, 226, 274, 313, 363, 405, 453, 504, 555			

	Page
*How to Compute Strength of Boiler Shells in Fuel Oil Practice—by Robert Sibley and Chas. H. Delany	313
How to Reduce the Cost of Merchandising—by W. M. Deming	514
*How to Splice Rope	462
Hydroelectric Development in Germany	80
*Hydroelectric Energy as a Conservator of Oil	299
†Hydroelectric Legislation in Sight, Effective	438
Hydroelectric Power, Need for More	572
*Hyperbolic Analysis for Engineering Problems	8

I

Idaho Engineers	473
Idaho, Utah, Wyoming and Montana Illuminating Engineering Society	110
..... 88, 235, 284,	475
The Income Tax and Your Income—by Charles P. Cutten	395
To Increase Output of Coal in Utah	430
Increased Demands for Power in Nevada	377
Increased Earnings at Portland	285
Increased Load for the Western States at Richmond	285
Increased Use of Electricity in New Zealand	448
Increasing Value of Liquid Credit Instruments	217
†Inductive Interference Legislation	538
Inductive Interference, Present Status of	543
*Industrial Electric Heating, Possibilities of	14
*Industrial Opportunities for Trained Women—by Clotilde Grunsky	343
†Industrial Protection, Flood Light Projectors in	538
*Industrial Records on the Pacific Coast, New—by Clotilde Grunsky	440
Industrial Women in France	503
Inflammable Christmas Displays, The Wiring of	565
Information to Applicants for Enlisted Ordnance Corps	475
*Injuries and Their Prevention, Eye	12
*Inspiration Copper, Electrical Winning of	147
Installation of Time Clocks—by Geo. A. Schneider	518
Instance of the Rewards of the Electric Pump	167
*Insulating Materials, Selection of	62, 114, 162
*Insulation, Types of Practical Heat	62, 114, 162
†Interconnection, Overpowering Argument for	184
†Interesting Commission Hearing	133
†An Interesting Problem in Dam Design	391
Interior Telephone Systems, Helpful Notes on—by Geo. A. Schneider	176
Interlinking the Electric Lines at Seattle	190
International Trade, Encouraging	448
Interurban Firms Must Pay Industrial Insurance	576
*Inventive Solution, War Problems for—by John D. Galloway	350
*Inventors Are Doing, What Western	44, 93, 193, 243, 290, 338, 384, 422, 468, 519, 568
Investigations on High Tension Insulators, Summary of	217
†Iron as a Conductor of Electricity	327
†Irresistible Trend Toward Centralization	36
Is the Regulation of Public Utilities a Success?	103

J

Japan, Electrical Activity in	117
*Japan, The Hotels of	498
Japan's Electrical Industries	449
*Jiggs and Maggie Assist in Electrical Aggrandizement	89
Jitney Bonds in Washington	191
The Jobber and the Contractor-Dealer's Association—by W. S. Berry	512
*Jobbers' Convention, Electrical Supply	187
The Jobber's Standpoint—by J. I. Colwell	560
Joint Pole Progress	378
Jones, E. C.—Answer to Letter	421
†Junk Heap, Value in the	280
Jurisdiction of Public Utility Commission	451

K

Kalispell Company Extends Service to Forty-two Ranches	286
Keep Water in Your Boiler	210

L

Large Increase in Electric Energy Output at Stockton	286
†The Last New West	438
*Latest in Everything Electrical	90, 138, 240, 287, 335, 380, 478, 528, 577
*Laurelhurst Club House	509
A League of the Southwestern States Legislation Affecting Oregon Public Utilities	524
†Legislation on Water Power, New	236
Lend Electric Apparatus Experts to the Government	132
Letter to the Editor on Accident Prevention	286
†The Liberty Loan	421
License for Handling Explosives	370
*Light Distribution from Projectors—by Waldo C. Cole	527
Limit of Service Required from Public Utility	547
*Liquid Credit Instruments, Increasing Value of	477
Los Angeles Aqueduct Decision, Silver Lake	104, 217
Los Angeles Firms Get Australian Business	358
*Los Angeles Jovian Electric League	286
..... 283, 375, 428, 524,	574
Los Angeles Section A. I. E. E.	524
Los Angeles Synchronous Club	574
Louisville Company Shows New Business Gains	238
Low Power Rates in Canada	449
†Loyalty	230

M

Making the Deserts Accessible	273
Mammoth Office Switchboard	59
Mammoth Tunnels of Hetch Hetchy Open to Bids	130
Man, Chemistry of	172
Management, Business Hazards and the Unearned Increment—by C. E. Grunsky	403
The Manufacture of Carbide from Lamp Black	421
*Marine Wiring	513
The Marvel of the Telephone—by J. F. Greenawalt	302
*Measurement of Electrolytic Corrosion—by B. A. Williamson	443
*Mechanical Energy from Volcanic Steam	210
Meeting Notices for Electrical Men	41, 87, 136, 235, 282, 331, 375, 427, 473, 524, 573
Men Wanted for the Army	578
†Merchandising, A Notable Advance in Merchandising, How to Reduce the Cost of—by W. M. Deming	514
Merchandising, Retailing and	203
†Merry Christmas	537
Metal Flume and Its Value from an Economical Standpoint	155
Meteorological Station, An Electrical Mexico, Opportunity for American Telephone System in	449
Mine Hoist, Electric	216
Mobile Experts Double	238
The Modern Electrical Contractor-Dealer—by W. M. Deming	561
*Moisture Content of Oils—by Robert Sibley and Chas. H. Delany	504
†Money Standards vs. Engineering Endeavor, Oriental	84
*Monkey Business, Electrical	510
*Montana Mine, Electricity in a	497
†More Effective Governmental Nurturing Needed	36
More Water Power Utilized in Sweden	29
*Mother Lode by Electricity, Rejuvenating the—by W. E. Eskew	446
Motor Equipment for Pulp Mill in Washington	253
*Motor Feeders, Demand Factors for—by F. D. Weber	459
Motors, Size of Service Wires for a Group of	168
*Multnomah Field in Portland, Special Lighting for—by F. H. Murphy	515
Municipal Charges, New Rate Basis for	445
Municipal Ownership of Public Utilities in Los Angeles	444
Must Carry Out Franchise Obligations	576

N

N. E. L. A. Don'ts for Sales Bureau	130
The National Association of Corporation Schools	545
National Ass'n of Elect. Contractors and Dealers	88, 376
The National Committee on Gas and Electric Service, Work of	235
*Nationalizing American Commerce	211
Need for More Hydroelectric Power	572

Netherlands, Prices of Gas and Electricity in the	223
Nevada Contractors and Dealers	574
Nevada Deserts, Underground Water in	270
*New Advance in Fuel Oil Economy	49
New Advances in Water Right Adjudication—by A. E. Chandler	309
New Bulletins	40, 86, 139, 192, 242, 289, 337, 382, 431, 479, 530, 579
New Business Activities on the Pacific Coast	237
*New Business Building Methods—by A. H. Halloran	415
New Business Gains and Contracts	238
A New Business Record for Colorado Power Company	285
New Cars for Honolulu Trolley System	378
†New Construction in California	83
*New Development of X-Ray Apparatus—by C. B. Merrick	528
New Electrical Developments	45, 94, 143, 194, 244, 291, 339, 385, 432, 480, 531, 580
*New Electrical Feature of Portland Rose Carnival	159
New Factory Load in San Francisco	285
*New Industrial Records on the Pacific Coast—by Clotilde Grunsky	440
New Insulator Tests	378
*New Lamp Uses	456
New Law for Elevator Inspection	116
†New Legislation on Water Power	132
News Notes	45, 94, 143, 144, 194, 244, 291, 339, 385, 432, 480, 531, 580
†New Opportunities for Women	278
New Power Business and Financial Items	285
New Rate Basis for Municipal Charges	445
New Radio Plant in Hawaii Most Powerful in the World	496
New Railway Electrification	377
†New Records in Steam Turbine Installation	231
†New Records in Water Wheel Design	327
†New Shipping Board	132
*New Southern Calif. Edison Co.	42, 43
*A New System of Fuel Oil Regulation—by Robert Sibley and Chas. H. Delany	506
A New Use for the Electric Fan	298
New Use for Electric Pump	180
†New West, The Last	438
New Zealand, Increased Use of Electricity in	448
Night Freight Hauling by Electric Railways May Lower Cost of Living	105
*Night Views	57
Nitrate Plants to be Rushed, Government	161
Northern California Power Company	239
Northern Electric	477
Northern States Power June Net Nearly Doubles in Four Years	238
Northern States Power New Business Gains	238
Northwest Crops Represent Money Value	238
*Northwest Electric Light & Power Ass'n	87, 197, 235, 282, 318
†Northwest, Great Awakening in the Norway, Water Power Development in	269
†A Notable Advance in Merchandising Notes on Contract Forms—by Geo. A. Schneider	566
Notes on Current and Potential Transformers—by Geo. A. Schneider	312
Notes on Public Utility Rates	53, 111, 214, 307, 355, 403, 450, *500, *551
Notes on Reclaiming Alkali Land	75
*Notes on the Law of Patents—by Wm. K. White and H. G. Prost	422, 468, 519, 568
Notes on Three-Phase and Ward-Leonard Winding Equipments for Mines	445
Notes on Under Voltage Release Attachment for Controlling and Protective Devices—by George A. Schneider	417
*Notes on Wiring Diagrams—by Geo. A. Schneider	77
Novelties, Some Recent	563

O

Oakland Jovians	428
Obituary	40, 86, 186, 281, 374, 426, 472, 523, 572
Obsolescence as an Element Affecting Rates—by C. E. Grunsky	307
*Of Interest to Utility Companies	89
†Off Peak Loads	231
Office Methods, Better—by H. H. Wade	397
Officers and Committees, Pac. Coast Sect. N. E. L. A.	186
Old Timer's Day—by A. H. Halloran	574

	Page
*Steam Engineering, Fuel Oil and...	32, 78, 127,
178, 226, 274, 313, 363, 405, 453, 504,	555
Steam Heating System—Spokane...	293
†Steam Turbine Installation, New	
Records in	231
*Stopping Places for the Engineer in	
Yokohama	399
*Storage Battery Charging Circuits,	
Protective Devices for—by Geo. A.	
Schneider	31, 122
*A Store Paper	511
Stream Flow, Forest Covering and	
Its Relationship with	7
Stream Measurements in Columbia	
River Basin	218
*Strength of Boiler Shells in Fuel Oil	
Practice, How to Compute—by	
Robert Sibley and Chas. H. Delany	313
†Success in Organization	182
*Successful Electric Truck Delivery	
Service	97
*Successful Use of Daylight Lamps...	431
*Suggestions for Contractor and	
Dealer	30, 76, 122,
176, 224, 311, 361, 417, 451, 463, 518,	566
Suit Against Accident Commis-	
sion in Washington	378
Suit Against Industrial Accident	
Commission of Washington	191
Suit Against Traction Company	190
Suit to Enforce Service	190
Summary of Investigations on High	
Tension Insulators	217
Summary of Work on the National	
Forest	304
Sweden, More Water Power Utilized	
in	29
Swiss Federal Railways, Electrifica-	
tion of	61
Switchboard, Mammoth Office	59
T	
Tacoma Railway and Power Com-	
pany's Report	426
*Technical Hints—by George A.	
Schneider	30, 76, 122,
176, 224, 311, 361, 417, 451, 463, 518,	566
†Technical Journalism, The Power of	
370	
†Technical School and Its Importance	
231	
Technical Schools Appreciate Pacific	
Coast Section N. E. L. A.	334
†Technical Societies, Too Many	371
The Telephone and Telegraph So-	
cietv of the Pacific Coast	524
Telephone Receipts	576
Telephone Systems, Interior	176
Telephony Will Be Used by the Navy	
in War, Wireless	59
†Temporary Construction Work, Elec-	
trical Equipment for	232
†Thanksgiving	437
Threatened Telephone Strike at	
Portland	333
Three-Phase and Ward-Leonard	
Winding Equipments for Mines,	
Notes on	445
Tires, Preferable Width of	64
†Too Many Technical Societies	371
Traction Rate Raises, Expert Re-	
ports on	223
Trade Acceptances, Advantages of ..	64
*The Trade Mark	562
Trade Notes	86, 141, 189, 336, 378, 476, 526,
575	
*Trained Women, Industrial Opportu-	
nities for—by Clotilde Grunsky	343
Transmission Problems in Long Dis-	
tance Telephony	442
†Transportation, Raising of Rates on	
216	
*Trapping the Gopher in Irrigation	
Practice	558
*Trapshooting by Electric Lights	137
*Tribute to a Pioneer Engineer	298
The Triumph of Electricity	232
†Trolley Companies Headed Toward	
Receiverships	97
*Truck Delivery Service, Successful	
Electric	10
Tungsten Filaments, Brightness of ..	184
†Tunnel Lining, Economic Pointer for	
Tunnels of Hetch Hetchy Open to	
Bids, Mammoth	130

Turbine Auxiliary in Alaska	286
Type of Direct Current Motor for	
Centrifugal Pumps—by Geo. A.	
Schneider	361
Type of Lamps Used in Park Light-	
ing	398
*Types of Practical Heat Insulation..	62, 114, 162

U

Underground Water in Nevada Des-	
erts	270
Underground Water Supply, A Typ-	
ical Instance of	310
Under-Voltage Release Attachment	
for Controlling and Protective De-	
vices—by Geo. A. Schneider	417
†Unified Action, A Proposed Plan for	
United Engineering Society, Engi-	
neering Council of	236
United Railways, San Francisco	430
*Unique Power Plant, Construction	
of a	392
University Extension Classes in Cal-	
ifornia	288
University Extension Course for Util-	
ity Men, A New	381
Urgent Needs of the Ordnance De-	
partment of the Army	286
Uruguay, Opportunities in	449
U. S. Engineering and Trade Ex-	
ports in the Far East	209
*U. S. Reclamation Service, Pumping	
Plants of the	108
Use Water Power and Save Fuel	5
Utah, Electric Power Development in	
—by W. R. Putnam	554
Utah Power and Light Company	
Offers Its Preferred Stock to Cust-	
omers	333
Utah Society of Electrical Contrac-	
tors and Dealers	323, 366, 420, 458,
573	
*Utah State Fair, Electricity at the—	
by C. W. Kendall	419
Utilities Commission of Idaho	190, 285
Utilities, War Policy of	1
†Utilities, War Policy of	37
†Utility Activity in the Far East	134
*Utility and National Service	89
Utility Asks for Rate Increases	377
Utility Financial Status, A Review of	
238	

V

*The Valuation of Reservoir Lands in	
the San Francisco Bay Region—by	
C. E. Grunsky	500
†Value in the Junk Heap	280
*The Value of a Conference	562
Value of a Voltmeter to a Contrac-	
tor—by Geo. A. Schneider	361
Value of Electricity, Great	71
Venezuela, Electrical Activity in	449
†Visual Instruction, The Power of	327
*Volcanic Steam, Mechanical Energy	
from	210
Voltage for Projector Lamps—by	
Geo. A. Schneider	225
Voltage Rating of Fuses for 500-volt	
A.C. Switches—by George A.	
Schneider	362
Volume of California Rivers Meas-	
ured	59

W

War Economy in Australia Affects	
Utility Organizations	542
War Policy of Utilities	1
†War Policy of Utilities	37
*War Problems for Inventive Solu-	
tion—by John D. Galloway	350
†War Service Committee in California	
487	
Washing Bottles by Electricity	379
Washington Association of Electrical	
Contractors and Dealers	235, 283, 305,
321	
†Waste Power in the Industries, The	
Saving of	489
Wastes, Some of the Preventable	
Wastes in America	113
Water Law, Recent Advances in	
Western	28, 74, 222, 309, 358,
451	

Water Power Development in Nor-	
way	269
Water Power Development on Trans-	
portation, The Effect of—by John	
E. Small	452
*Water Power in Southwestern United	
States—by E. C. Murphy	549
†Water Power, New Legislation on ..	132
Water Right Value, Appreciation,	
The Bonus	53, 111,
214	
*Water Spout	117
†Water Wheel Design, New Records	
in	327
*Watering Places for the Engineer	
Touring the Orient	356
†The West Comes Into Its Own	537
West, Electrical Problem Peculiar	
to the	19, 65
†West, Why It Looks Good in the	182
Western Coal in Storage, The De-	
terioration of	404
*Western Ideas	510, 562
Western Power Corporation	477
Western States Company Secures	
Large Gas Contract	239
Western States Gas and Electric	
Earnings	430, 477
Western Water Law, Recent Ad-	
vances in	28, 74, 222, 309, 358,
451	
*Western Windows That Win	352
Westinghouse Motors for Nevada	286
*What Western Inventors are Doing	
44, 93,	
193, 243, 290, 338, 384, 422, 468, 519,	568
†When Patience Ceases to Be a	
Virtue	183
*Whitesboro-Corvallis Electrification ..	200
†Why Engineering Colleges are a	
Failure	488
†Why It Looks Good in the West	182
†Why the Contractor's Association ..	437
Why the Shields Water Bill Should	
Pass	346
Width of Tires, Preferable	64
*Window, A Pre-holiday	511
Wireless Telephony Will be Used by	
the Navy in War	59
*Wiring Diagrams, Notes on—by Geo.	
A. Schneider	77
*Wiring Features of the Portland Au-	
ditorium—by F. D. Weber	412
The Wiring of Inflammable Christ-	
mas Displays	565
Wiring Rules for French Ships	564
Wives are Wage Earners, Growing	
Number of	466
*A Woman Electrical Dealer—by Lil-	
lian Palmer	465
*A Woman's Band at the Utah State	
Fair	401
Woman Situation, England and the ..	467
Women After the War	401
Women as Electric Railway Em-	
ployees	401
Women, Higher Positions for	466
Women in France, Industrial	503
Women in Present Day Japan	402
Women in Technical Electricity	402
Women in the Industries	371
*Women in the Industry	401, 465, 503
†Women, New Opportunities for	279
Work of the National Committee on	
Gas and Electric Service	235
Working Capital and Collections—by	
Geo. A. Schneider	224
Workmen's Check Clocks	266

X

*X-Ray Apparatus, New Development	
of—by C. B. Merrick	528
X-Rays, Rival to	172

Y

*Yokohama, Stopping Places for the	
Engineer in	399
*The Y. W. C. A. in Your Industry ..	503

Z

†The Zone System a Just One	437
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JOURNAL OF ELECTRICITY

VOL. XXXIX No. 1

SAN FRANCISCO, JULY 1, 1917

PER COPY, 25 CENTS

—fortified

against burnouts of Heating Elements by

EXCLUSIVELY
Hotpoint

Hotpoint
Safety Switch

OPERATES
AUTOMATICALLY

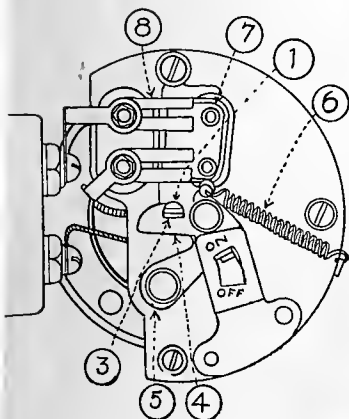
Hotpoint Valveless Percolators Dominate the Hollow-ware Field

Operation and Construction of *Hotpoint* Safety Switch

Illustration at left shows *Hotpoint* Safety Switch as viewed from the bottom of the appliance, with base plate removed. Explanation of numbered parts follows: The Thermostat Post, 1, composed of German Silver, is fastened to the upper inside surface of Heating Element Case, 2. The Thermostat Tongue, 3, is fastened to 1. This Tongue is composed of two sheets of metal of unequal expansion which when subjected to too much heat will bend far enough to release the Catch, 4, that is fastened to the Arm, 5, upon release of which, 4, is jerked back by the Coil Spring, 6. Thus the Blade, 7, is disengaged from the Spring Contacts, 8, opening the circuit. The Safety Switch remains in "OFF" position (shown by indicator) until it cools and operator sets it back to "ON", after which the appliance is ready for further service.

HOTPOINT SAFETY SWITCH CAN ONLY BE INSTALLED ON PERCOLATORS ORIGINALLY DESIGNED AT FACTORY FOR ITS ACCOMMODATION.

*User can put appliance back into service without any expense
or trouble, or without returning it to factory or dealer*



Other Reasons for Hotpoint Percolator Dominance

- exclusive, valveless, troubleless Percolator Apparatus
- uninterrupted, satisfactory service
- superior high quality design and finish
- the prestige of the **NATIONALLY KNOWN** and **ADVERTISED** name *Hotpoint*

Why not specialize on such a line of Hollow-ware

and thereby protect yourself against loss of consumer good-will—costly repair upkeep—and loss of current revenue!

Write our Ontario, Cal., office for *Hotpoint Tableware Booklet*—it illustrates and describes entire *Hotpoint* Tableware Line.

HOTPOINT ELECTRIC HEATING CO., Ontario, Cal.

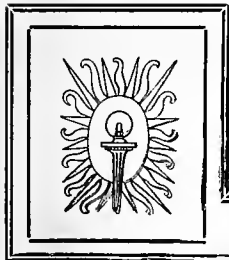
(Service Stations at San Francisco and Seattle)



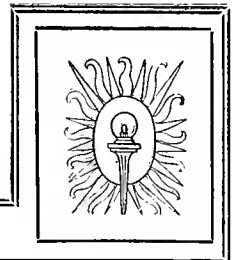
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JOURNAL OF ELECTRICITY



Devoted to the Generation, Distribution and Utilization of Energy

VOLUME XXXIX

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NUMBER 1

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WAR POLICY OF UTILITIES

BY A. W. LEONARD

(Here is an excellent outline of a comprehensive war policy for utilities throughout the West. The inner response that is awakened in every citizen upon reading such broad gauge ideals as these serves to cement closer and closer the ties that bind in unity the utility life of the nation with the public it serves. The author is president of The Puget Sound Traction, Light & Power Company. —The Editor.)

A new problem confronts the utility managers of the country. It is that of keeping pace with increasing industrial activity on the one hand, with a material shrinkage in capital available for development or for any sort of public improvement on the other. The burden of the war must be carried through heavy taxes and the sales of bonds. The \$7,000,000,000 which the people are asked to provide through taxes and purchase of war bonds during 1917 exceed the total amount the nation as a whole saves each year for investment purposes. Thus it becomes apparent that the savings which ordinarily go to further the development of industry and into public improvements will be used to carry on the war. If this is true then there will be little, if any, new capital available for the extension of industrial or transportation properties, or even for any considerable public improvements.

To summarize the situation:

The period of the war will be one of tremendous industrial activity with a correspondingly enlarged demand for labor, both skilled and unskilled.

The savings of the people invested ordinarily in industrial development and public improvements will be required almost wholly to carry on the war.

Millions of men must be diverted from the present channels of production and employed in ways that are unproductive, which is to say in the activities of war and those allied with war, or with the exclusive production of the vast machinery of destruction for the use of our army and navy. Drafts and enlistments, government departments, war relief organizations, the production and delivery of war supplies, all will require armies of workers. Cantonments must be built, a great army equipped and drilled, munitions factories, ship yards, lumber camps, steel mills must be manned and operated to fullest capacity and all of this must depend for success upon greater farming activity for all workers everywhere must be fed. All of these activities must be paid for; which means that the money ordinarily invested in railroad, utility and municipal securities will be needed by the government,

and this must result in a corresponding decrease in the amount of capital available for the extension of industrial enterprises or for public improvements of any character.

Great Britain has passed through the experience upon which we are now entering. The London Economist shows in a recent issue what happened there. In 1914 there was invested in public utilities in that country \$66,500,000. In 1915 only \$5,000,000, and in 1916 it dropped to \$600,000. In 1914 the investments for the year in municipal loans was \$15,500,000; in 1915 nothing and in 1916 \$2,500,000. There has been no development there for three years of any industry that did not contribute directly to war requirements.

Sensing this situation the Puget Sound Traction, Light & Power Company is preparing to meet it by the adoption of a policy of readjustment of which the following are the essential features:

Exemptions from army or navy service will be asked for only for such employes as are really needed to keep up adequate service.

To do this intelligently our employes of the stipulated age qualifications will be grouped and studied and such changes made in their employment as will enable us to serve the government to the best of our ability and yet not impair service. Men of engineering or construction experience, so far as possible, and as fast as possible, will be spared, as they will be particularly desirable for government work.

Whenever a man leaves to enter the army or navy we will first see whether or not a readjustment can be made so that his work may be handled by others in the organization, and if not will employ a woman to take his place or move up some other employe and put a woman in the place of the employe so moved.

A careful investigation will be made in every department with the purpose of discontinuing an operation which can be temporarily or permanently dispensed with without loss of efficiency or impairment of service. We will cut out detail as far as possible and devote our energies to essentials.

On all lines, wherever conditions warrant, we desire to encourage one man operation of cars, believing it will result in better and more satisfactory service. However, no man need fear losing his job if he does his work as there will be more than enough work for all available men.

We shall try to secure the co-operation of power customers, through the readjustment of hours of closing and the changing of shifts, in decreasing present peak load requirements, and will devote our own business getting energies to this end.

Renewals and replacements will have to be postponed wherever this can be done without serious detriment to service. Cost of such work at this time is excessive, and with no new capital available until government needs are provided for, the only funds

upon which we could draw would be surplus from earnings. For the same reason all construction work now under way must be discontinued as far as practicable.

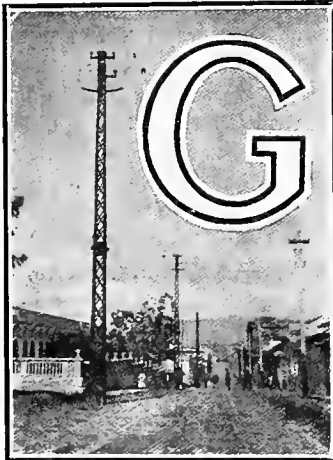
Careful study and consideration will be given to all rates charged for service. Labor and material are constantly increasing in cost and rates may have to be higher, too. Thirty-six street railway properties in this country have recently increased rates, and other places have that matter under discussion. Unless some other readjustments can be made rate increases will have to become universal.

We will ask city officials and public authorities in this state to study the situation and aid us in carrying these policies into effect by giving us the benefit of their suggestions and co-operation.

CENTRAL STATION PRACTICE IN CENTRAL AMERICA

BY J. W. FINCH

(Much has been published in a general way during recent months, concerning opportunities in Central and South America for the American engineer. Little has, however, appeared relative to details of central station practice there in vogue. Such knowledge is quite necessary for anyone to know who hopes to mingle with our neighbors to the south either in an engineering or in a commercial way. Here is an extremely interesting article by a representative of the Journal of Electricity who is devoting a whole year in travel, informing himself on the general business and commercial conditions of Western South America. The author has had years of engineering experience in California, both in commercial and in constructive engineering effort and as a consequence this report should prove of unusual interest to engineers throughout the West.—The Editor.)



Typical Transmission Lines in Central America

principal product of the country is coffee, there being some 2000 coffee "fincas" or plantations producing annually something like 100,000,000 pounds. The coffee exported from Guatemala is noted for its excellence, and the value amounts to about 2/3 of the total exports of the country. Sugar, cotton, bananas, cacao, rubber, hides, chicle, mahogany, and dye woods make up the other principal exports.

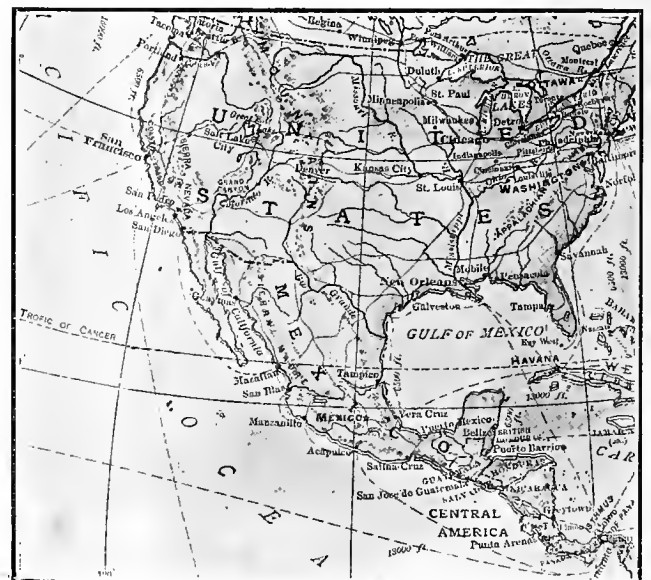
Guatemala is so situated with Puerto Barrios on the Caribbean Coast and San Jose on the Pacific, that it can successfully trade with either the eastern markets of the United States or the markets of the west coast. Guatemala City, the capital of the Republic, with its population estimated at various figures between 90,000 and 125,000, is the distributing center for the entire republic.

Notwithstanding the apparent disadvantages of American Pacific Coast states in geographical relation

GUATEMALA, the largest of the Central American Republics, has an area of 48,290 square miles, and a population of 2,200,000. The greater part of the Republic lies at an altitude of from 4,000 to 11,500 ft. and the many plateaus are productive and healthy. The mountains are ribbed with minerals, gold, silver, copper, iron, lead, zinc, and antimony, but owing to inadequate transportation facilities, development of the mining industry has been slow. The

to Guatemala we have been enjoying considerable business and much more is to be had by aggressive sales efforts and a spirit of co-operation. Our crying need at the moment is steamers to successfully handle the commerce that can be developed. Aside from the export of goods from our own ports it is safe to say that return cargoes will be guaranteed by Guatemalaecos. Of the many products of the country which could be successfully shipped to the United States west coast markets, we already know Guatemala's coffee, bananas, cacao, hardwoods, etc. Given adequate shipping facilities we should have no difficulty in successfully competing with our brothers in the East.

Guatemala City is served with electric light and power by the Empresa Electrica de Guatemala, a com-



Central America and its Relationship with the United States



One of the Many Typical Natural Water Power Sites of Central America

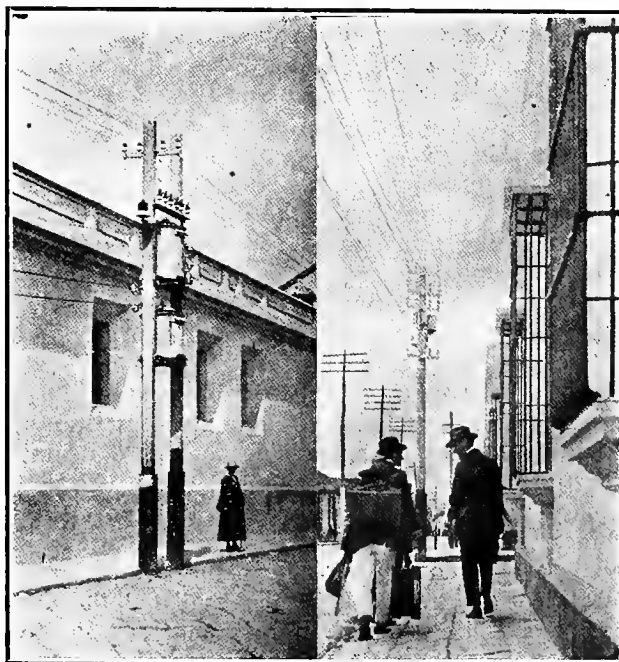
pany owned and controlled by German capital. This company operates under a concession which was obtained many years ago and which gives them a practical monopoly in the city. Power is generated by means of a hydroelectric plant located on the Michatoya River near Palin, 30 miles from the city. Transmission is over fabricated steel poles to a substation located in the company's office building a few blocks from the center of the city. Distribution lines about the city are carried on steel poles which consist merely of, approximately 5/16 in. by 3 3/8 in. by 7 1/2 in. I beams 30 ft. in length. Cross-arms consist of short channels bolted to the I beams by means of J bolts. Sometimes wires are carried on brackets on the side of the pole, the bracket being a special hook bolt arranged to clamp over the edge of the I beam. A barbed ground wire is invariably carried on the top of the pole. Distribution transformers are mounted on angle iron frames or platforms supported between two poles. These too, are fastened to the steel poles by means of J bolts. The remarkable feature of the entire construction being its simplicity and the fact

that absolutely no holes are required in the I beam section or pole. In rare instances will be seen wooden poles but considered as a whole the distributing system is well constructed and the materials used indicate a permanency and high standard which should insure uninterrupted service.

With hardly any exception the houses here are adobe and the method of attaching service wires to the buildings is to use a steel hook bracket, cemented into the wall. The wiring in the houses is, almost without exception exposed, being run on cleats requiring but one screw, and spacing the wires about 1 1/8 in. apart and 1/2 in. from the ceiling or wall. Weatherproof wire is used inside as well as outside and in most private residence installations No. 16 is the standard size. All wiring supplies and fixtures were, until prevented by the war, imported from Germany and the system of inside wiring used is the old system which was in use in Germany many years ago, what we would call the Old Code. A peculiar custom in vogue here is, the tenant of a house has it wired at his own expense and when he moves he has the wires taken out and moved with him to his new house. This is rather hard on the tenant, but profitable for the lighting company.



The Office of the Empresa Electrica de Guatemala



Distribution Line Construction

Street Scene with Pole Lines

Although this is a city of almost 100,000 population, service, both lighting and power, is on a flat rate basis and among the rules and regulations of the Empresa Electrica it will be found that the use of incandescent or arc lamps is permitted only from nightfall until 5 o'clock in the morning and if the light is used any time during the day the Empresa (company) reserves the right to charge double rates. The operation of motors is limited to the hours between 7 in the morning and 5 in the afternoon with the exception of Sundays and holidays when there is no current. The Empresa reserves the privilege of shutting off the current any day they wish between 11 and 12 o'clock. Other interesting excerpts from the company's regulations provide that the Empresa Electrica supplies current only for those motors, lamps and other electrical apparatus that they have agreed upon and will not permit the connection of any other current consuming devices to its wires.

The service will be suspended in all cases where any suspicious installation is found, or where lamps of any other system or different size to that supplied by the company, or contracted for with the company, is found. If in the judgment of the board of directors of the company the circumstances seem to justify, in such case the service will be renewed upon the payment of double rates for six months, the consumer forfeiting all right to the use of wall attachment plugs and extension cords for portable lights. The consumer is further advised that even though he should live up to all the regulations and faithfully fulfill his contract, the company nevertheless reserves the right, at any time to suit its convenience, to discontinue the service, giving the customer one month's written notice. There are many other interesting regulations of the company and in which they are fully protected by their concession. For example, they have an absolute monopoly in the city of Guatemala both for the supply of current and the wiring of houses. Four merchants of the town have recently secured permits to sell electrical goods but they are not particularly enthusiastic as every thing they sell in Guatemala City is in a way under the supervision of the Empresa Electrica and practically all of their business must be done in the outlying cities and the country.

All payments for lighting or power service is strictly in advance and the use of heating appliances or any other special apparatus is not allowed unless the apparatus is purchased from the Empresa. The reason of course being the desire and necessity of knowing where the appliance is to be used. At this time the Empresa refuses to connect any new day-load business as they are carrying their maximum capacity. They have under construction, however, a new plant which will give them an abundance of power to supply all needs. All apparatus, generating equipment, etc., comprising the present plant, transmission and distributing system are of German manufacture. This will also be the case with the new plant excepting possibly the turbines which may be "Francis" high-head turbines. Plans were made for the new plant while Germany was still at peace, and they contemplated the use of Siemens-Halske generating equipment and the foundations and other concrete work are being prepared, in the hopes that delivery can be made on these Ger-

man machines in time to complete the plant on schedule, which will be about two years hence.

The importation of firearms, ammunition and electrical goods into the Republic of Guatemala, is prohibited by law, unless a special permit is obtained from the government. In the case of electrical goods, the permit is applied for by the importer and the method of procedure is, to address a communication to the Ministerio de Fomento (Minister of Public Works) on what is called official paper, which paper bears the coat of arms of the Republic and for which you pay fifty centavos per sheet. This official application must



Guatemala Awaits Modern Methods of Transportation

contain a detailed account of what you wish to import and a statement of the purpose or uses of the goods. If the Ministerio de Fomento approves, he passes your application on to the Ministerio de Guerra (Minister of War) and he to the Ministerio de Hacienda (Minister of the Treasury). If the approval of all of these officials is obtained, you will receive the permit within probably two or three weeks, never any less. Then you are ready to file another application for a permit allowing you to pass them through the custom house. This application follows practically the same course as the previous one excepting that it does not take quite as long to get it through. After the necessary permits are given and your goods arrive you must visit the custom house at the convenience of the inspector from the Empresa Electrica, who will go over your goods with you to see that they coincide with the items you specified on the original application. With all of this apparent difficulty, however, if the interested dealer here anticipates his wants and makes his application in due time, there seems to be little or no difficulty in importing electrical goods, excepting possibly telegraph or telephone equipment or apparatus.

The furnishing of heat, light and power service to the troop cantonments for the mobilization of the military forces located in different parts of the country is now being considered by the National Committee on Gas and Electric Service, and information is being collected as to how these agencies may be made available to the camps in the shortest possible time from the nearest points of supply.

COMMERCIAL AND ENGINEERING EXPANSION ABROAD

BY JOHN CLAUSEN

(The growing engineering and commercial relations with our Pacific foreign neighbors make this contribution by the head of the foreign exchange department of the Crocker National Bank of timely interest. In it the author tells the readers of the Journal of Electricity some of the ways in which commercial and engineering activities looking toward advancing the superiority of American goods may be made aggressive realities.—The Editor.)

It would be well to study the objects of the new "British Trade Bank" now in process of formation for the purpose—as its name implies—of furthering the commerce of Great Britain. That institution when organized and operated under efficient management, with the power to base on its capital a forceful system of credit in the shape of acceptances, will no doubt soon gather the nucleus of a large foreign business.

As a striking example of the great activities for the advancement of their international trade relations, it is of the greatest importance to recognize that British oversea banks alone have capital exceeding 500 million dollars as against but 5 or 6 million dollars so invested by North American interests.

In the economic life of a Nation commerce and banking are so closely interwoven that it becomes essential for every person engaged in business to have some knowledge of the parts played by these factors. The nature and use of money, the mechanism of exchange and the development of banking in various parts of the world are features of vital concern to the commercial interests of our country.

Co-operative combinations such as may be deemed expedient to develop our foreign relations in normal times, are essential and should in no sense be considered a contractional restraint of free trading. A recognition of this principle in oversea trade development is in my opinion most necessary to our economic progress. Such privileges very naturally should only be accorded American-owned concerns, and co-operative ownership of stock in competitive organizations must obviously be prescribed.

If the claims for superiority of American goods are made aggressive realities,—and careful, direct and persistent efforts exercised by American manufacturers in their introduction and exploitation, it should not be difficult to make permanent our present pre-eminent position in world commerce.

It appears that to advantageously maintain our place in the international relations, we need not only an efficient banking system and a well-equipped merchant marine, but more especially scientific commercial education. It cannot be too strongly emphasized that these problems must be seriously taken under advisement, as a plain matter of modern development, requiring attention along feasible and intelligent lines.

Viewing the subject of business education from the standpoint of clear judgment, it becomes apparent that a necessity exists for training our young element in the early stages of their development for business and labors which will devolve upon them when at manhood they enter upon their active career.

The business world today is vitally interested in this problem for no organization can succeed in a material degree whose workers are not efficient. The foundation of National prosperity clearly rests upon that result accomplished by its people to serve real purposes in sympathy with current industry, science and government. If we can encourage early, direct business training, the usefulness of the populace of our country will assure both trading power and wealth.

The measure of success to which we are entitled will largely depend upon our ability to meet in organized and scientific strength the competition of foreign contemporaries. If we are to become the financial center of the world and gain supremacy in international trade, we must make adequate preparation for retaining these advantages as well as assuming all their responsibilities and obligations.

USE WATER POWER AND SAVE FUEL

Editorially, the Journal of Electricity has for some time past been strongly advocating the use of water power and the saving of fuel oil by interconnecting the hydroelectric plants of the West.

Secretary Franklin K. Lane of the Department of the Interior, in reply to a letter from the manager of an electric light and power company, made the following statement as to the policy which such companies should follow during the war in the production of electrical energy:

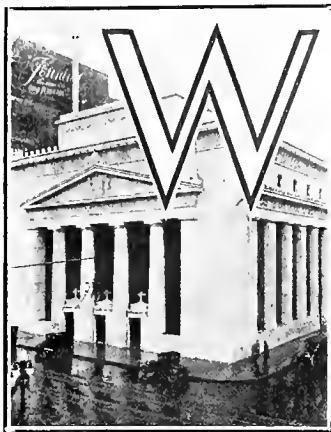
"The unusual demands arising from the entrance of the United States into the war and the necessities of the allied governments have made the situation in this country acute. We must not only supply large additional amounts of fuel for the manufacturing industries, including munitions of war, but we must to a certain extent furnish fuel to our allies. The stimulation of production, the regulation of distribution, and, within economic limits, the elimination of unnecessary consumption of fuel, are therefore problems of national interest and of immediate concern.

"Although it will be necessary to use the coal and oil now being produced to the highest possible advantage, it must be recognized that the requirements of the nation for energy are increasing rapidly, especially in regions of great industrial activity. Obviously, immediate conservation of fuels can best be accomplished by utilizing all available water power. New requirements for power should therefore be met so far as practicable by the installation or enlargement of hydroelectric plants; present requirements should be satisfied by substituting all available water power for steam generated energy requiring coal and oil for its production. This means that all water available at water-power plants should be made to produce energy up to the practicable hydraulic capacity of the works and the requirements of the population and industries within transmission distance of the site. In regions where water power can be made available steam-power plants should be operated only to carry loads in excess of those that can be carried by water-power plants. In my opinion this course should, under existing conditions, be followed by all power companies, regardless of the fact that at the moment it may be cheaper for the company to produce steam power."

BANKING INSTITUTIONS "DOING IT ELECTRICALLY"

BY F. D. WEBER

Artistic and efficient lighting of the great banking institutions in the West has proved a problem intricate in design for the electrical engineer. The marked success not only attained in bringing about the combination of these two qualities, but in completely equipping a banking institution electrically, has called forth unusual praise at Portland, Oregon. Here is an excellent description of the beautiful results that have been obtained in illumination, burglar proofing, elevator service, time checking and other conveniences at the First National Bank in that city. The author of this article is the Portland representative of the Journal of Electricity.—The Editor.)



First National Bank Building at Portland, Flood-lighted

HAT probably is recognized as the most pretentious and elegant bank building on the Pacific Coast has just been completed on a quarter block of land at the southwest corner of Fifth and Stark streets, Portland, Oregon, by the First National Bank.

Work was commenced in April, 1915, and the bank occupied it on November 20, 1916, after 19 months of construction work.

The exterior of the building, as designed by Coolidge & Shattuck, Boston architects, is patterned after the Athenian Parthenon, the Grecian masterpiece. Even the decorations carved in the Colorado Yule marble which, forms the exterior, are of Grecian design, and the figures which hold up a copy of the old territorial seal of the State of Oregon, are Greek forms. The entrance passageways themselves are small reproductions of Greek temples, the design differing to that extent from the Parthenon in Athens.

The interior of the building embraces substantially 40,000 square feet of floor space, including the basement, where the heating plant, the locker rooms and the safety deposit vaults are located. The savings and trust departments are located on the first floor and the main banking room on the second floor, which is approached by a wide stair-way. From the second or main floor, tall sogliola (or imitation marble) columns, said to be the largest in the country, stretch to the ceiling and skylights above the mezzanine and top floors. These columns serve three floors. The mezzanine floor is given over to working space for the clerks and bookkeepers and

top floor is divided into rest-rooms for the women and men employes and into storage rooms. Elevators serve both sides of the building.

The interior has been finished for the most part in Botticino (Italian) marble. The gray marble used in the floors came from Knoxville, Tenn. The office furniture used is mahogany. The decorative scheme of the interior is pure Greek, the designs having been marked out under the supervision of Pennell, Gibbs & Quiring of Boston.

The electric fixtures carry the decorative scheme out, even as regards coloring in both the fixture and glassware. This is the first installation of this character attempted in the Northwest.

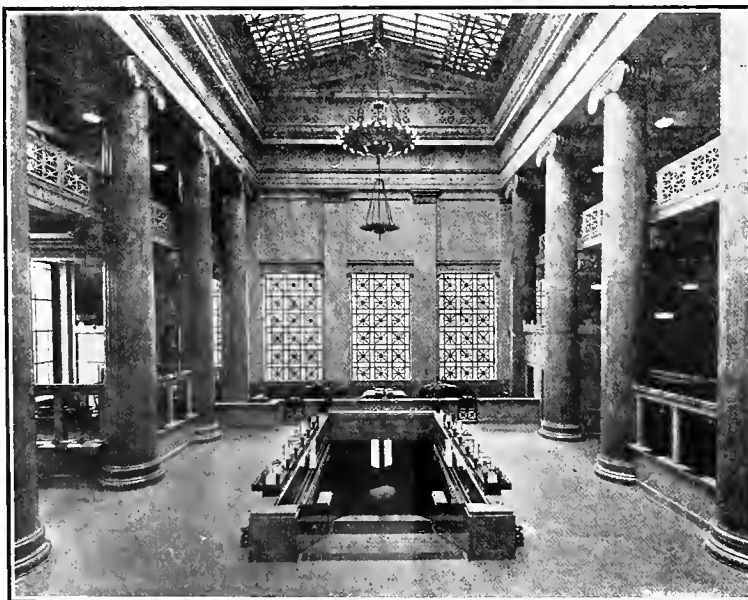
The electric fixtures combine the indirect and direct methods.

The unique part of this installation is the volume of electric equipment installed in a bank building where not very much is to be ordinarily expected. In this building the following equipment is installed: All the outlets except base plugs are on separate circuits. All wire and cable are 30 per cent Standard underground cable, consisting of about 20,000 ft. feeder. There are sub-feeder cables to the extent of 60,000 ft. of duplex circuit wire. All sheraduct conduit and fittings. The main service switch is a 2000 amp. oil break switch, and the main service cables consist of three 1,000,000 cir mil cables. There are five automatic coin elevators and four passenger elevators. The installation required twenty-one motors of 120 h.p. The total number of lighting circuits is 250. Besides this equipment, ample floor outlets are installed for future connections.

Empty conduit is installed completely encircling each floor, for installation of future wiring of any kind that may be required. Conduit is also installed across the spaces, so that in event of running the future circuits, the floor or walls will not have to be torn up.

Practically all lights are controlled by wall switches, three and four way control being used extensively for convenience of control and economy of current.

Provision has been made for the flood-lighting of the building from across the street. For this purpose 6-500 watt close range lights have been erected on top of a building across the street.



Main Banking Floor, showing Artistic Features in Lighting Fixtures

THE MAIN BANKING FLOOR

In this recent creation at Portland, electricity is made to contribute every conceivable service in effective burglar protection, fire proofing, elevator facilities, and illumination effects, hitherto unattempted in banking institutions of the West.

One four and one ten point Bryant "Silent Call" signaling system for officers, is installed.

The building owns all the conduit in which the Pacific Telephone & Telegraph Company and the Home Telephone Company have their service installed inside this building. This was installed by the electrical contractor during the construction period. There are 56 telephones in use.

The three main fixtures, with 6 circuit capacity each, are controlled from the second floor through Cutler-Hammer solenoid switches.

All the motors are remotely controlled, by Cutler-Hammer remote control apparatus, from a point in the basement in the boiler room with a pilot light signal on each.

A 5 h.p. stationary Blaisdell vacuum cleaner system is installed in the basement.

All of the electric cabinets have brass fronts—bronzed. The panel boards are white Italian marble.



Interior of Bank, Electrically Lighted

They were manufactured by the Western Electric Works, Portland, Oregon. The vaults are protected by the A. D. T. Co.'s burglar alarm and it, together with all other signal systems, are in conduit.

All rheostats and control apparatus throughout the building are installed in ventilated iron cabinets. Great Western refillable fuses are used throughout as a regular maintenance man will be in charge.

One of the features of the interior is a large wall clock located at the west end of the banking room facing the entrance. Besides this one there are two others, and they are all operated from a duplicate storage battery of 12 cells at 24 volts. Howard clocks are used.

It is so inspiring to know that it was the intention to have this building the best "wired" building of its type in the country, and no expense was spared to make the electrical installation complete, and to provide for the future possibility in the electrical line.

The specific equipment is as follows:

Lighting

22 cirs. in basement, west side.
22 cirs. in basement, east side.
60 cirs. in first floor.
52 cirs. in second floor.

36 cirs. third floor.
28 cirs. in fourth floor.
24 cirs. in attic.
6-500 watt flood-lights.
Power
1-5 h.p. on exhaust (foul air).
1-5 h.p. on air washer.
1-7½ h.p. on fan fresh air.
2-5 h.p. on sump pumps.
1-5 h.p. on exhaust fan.
1-½ h.p. air compressor.
1-5 h.p. vacuum cleaner.
2-5 h.p. pumps for boiler feed.
2-5 h.p. fans circulating air.
2-5 h.p. air washers.
1-2 h.p. exhaust fan.
3-8 h.p. elevators.
5-½ h.p. coin elevators.
47 adding machine motors.

THE FOREST COVERING AND ITS RELATIONSHIP WITH STREAM FLOW

An interesting paper was recently presented at the Forest Supervisors' meeting in Portland, by Wm. B. Osborne, Jr., on the subject of "What does forest fire protective work accomplish for the public?"

In his concluding remarks the speaker brought out the fact that the maintenance of the forest cover for regulating stream flow, is an aspect of immense portance, unmeasurable mathematically, but in many localities admittedly of much greater value to the public than the potential value of the timber as a raw product. As a suggestive illustration of simply one phase in which the forest cover tends to regulate stream flow, he referred to a study recently completed on the influence of Douglas fir forests upon the melting of snow. In this work, a detailed study was made on numerous sites of varying aspects and elevations, of the rate of melting in the timber as compared with the rate of melting in the open. The conclusions were that the forests on the flat retarded melting sufficiently to prolong the supply an average of three weeks after the open ground was bare; the forests on the mountain slopes retarded the melting for periods of from six to seven weeks, and on the average, the water equivalent of the snow remaining in the timber after the open ground became bare was thirteen inches.

These figures are more incisive than any so far brought to light by the forest service and tend to confirm what had been anticipated; that is that any extensive denuding of the forest cover would result in disastrous floods. On the other hand this retarding of the melting, taken together with the natural moisture conserving characteristics of the forest floor, tends to protract the run off so that a considerably larger volume is available for irrigation throughout the dry season. The enormous sums spent in constructing ditches and artificial reservoirs for increasing the minimum flow of streams both for irrigation and power development, tend to emphasize the inestimable value of our forest cover as a natural reservoir. Its effect upon transportation and in the maintenance of a pure and ample water supply for municipalities, is so clear and yet so ramifying that it is simply mentioned.

ROAD MILEAGE IN CALIFORNIA

According to the reports received, California had at the close of 1914 a total of 61,039 miles of public roads, of which 10,279.73 miles, or 16.84 per cent, were surfaced. Of the surfaced roads 929.19 miles were concrete 837.4 macadam, 877.9 bituminous macadam, 3,563.59 gravel, 582.25, sand-clay, and 3,489.4 oiled earth.

HYPERBOLIC ANALYSIS FOR ENGINEERING PROBLEMS

BY W. D. PEASLEE

Analysis by means of mathematical equations involving hyperbolic functions is often difficult of application due to a lack of groundwork in handling these important weapons of higher mathematics. In the issue of May 15, 1917, the author laid down the fundamental principles involved in such work. In the following pages he cites definite problems for solution and carries the solution to a conclusion. The engineer should find this article of unusual helpfulness in tackling problems of this nature in the practical application to electrical engineering. The author is in the department of electrical engineering at the Oregon Agricultural College and is also a well-known consulting engineer of Portland.—The Editor.)

The values of mx , $\cosh mx$, and $\sinh mx$ for fifty mile intervals of x from 100 to the generating end of the line ($x = 500$) are tabulated in Table I for convenient reference. These values are taken from one of the tables in the bibliography.

Table I.

x miles	mx	$\cosh mx$	$\sinh mx$
100	.0154 + j.2605	.978 + j.003	.017 + j.205
150	.0231 + j.331	.952 + j.0078	.023 + j.305
200	.0308 + j.412	.917 + j.012	.028 + j.398
250	.0385 + j.517	.871 + j.018	.032 + j.495
300	.0462 + j.62	.815 + j.027	.038 + j.581
350	.0540 + j.724	.743 + j.036	.040 + j.663
400	.0616 + j.827	.677 + j.045	.042 + j.736
450	.0693 + j.930	.599 + j.056	.0435 + j.804
500	.0770 + j1.032	.514 + j.068	.0410 + j.844

$$E/m_1 = 144,000 / (383 + j74.6) = 361 - j70.4.$$

$$I = 150,000 / (250 \times 3\frac{1}{2} \times .85) = 408 \text{ amps} = 347 - j214 \text{ amps.}$$

$$\text{For the generator end } x = 500 \text{ and for no load } I = 0 \text{ so}$$

$$e_g = E \cosh mx = 144,000 (.514 + j.068)$$

$$= 74,100 + j9790$$

$$= 74,700 / 7^\circ 31'.$$

$$\Phi = \tan^{-1} 9790 / 74,100$$

$$= 7^\circ 31'.$$

The voltage for no load at other points in the line is computed in the same way using the proper values from Table I and the results are plotted in Fig. 4.

For no load current

$$i_g = E/m_1 \sinh mx = (361 - j70.4) (.0410 + j.844)$$

$$= 75.4 + j302 \text{ amps.}$$

$$= 312 \text{ amps.}$$

$$V = \tan^{-1} 302 / 75.4 = 76^\circ 31'.$$

$$\theta = V - \Phi = 76^\circ 31' - 7^\circ 31'$$

$$= 69^\circ.$$

In connection with the angles Φ , θ , and V it should be noted that positive j indicates a leading vector with reference to the reference vector and,

Φ = the angle between E and e_x referred to E as a base.

V = the angle between E and i_x referred to E as a base.

θ = the angle between e_x and i_x referred to e_x as a base.

Thus at no load the generator current leads the generator voltage by an angle of 69° . The charging current at other points has been calculated and plotted in Fig. 4.

For full load,

$$e_g = E \cosh mx + m_1 I \sinh mx.$$

$$= 144,000 (.514 + j.068) + (347 - j214) (383 + j74.6)$$

$$= 128,160 + j133,800.$$

$$= 185,000 \quad \Phi = 46^\circ 8'.$$

$$i_g = I \cosh mx + E/m_1 \sinh mx.$$

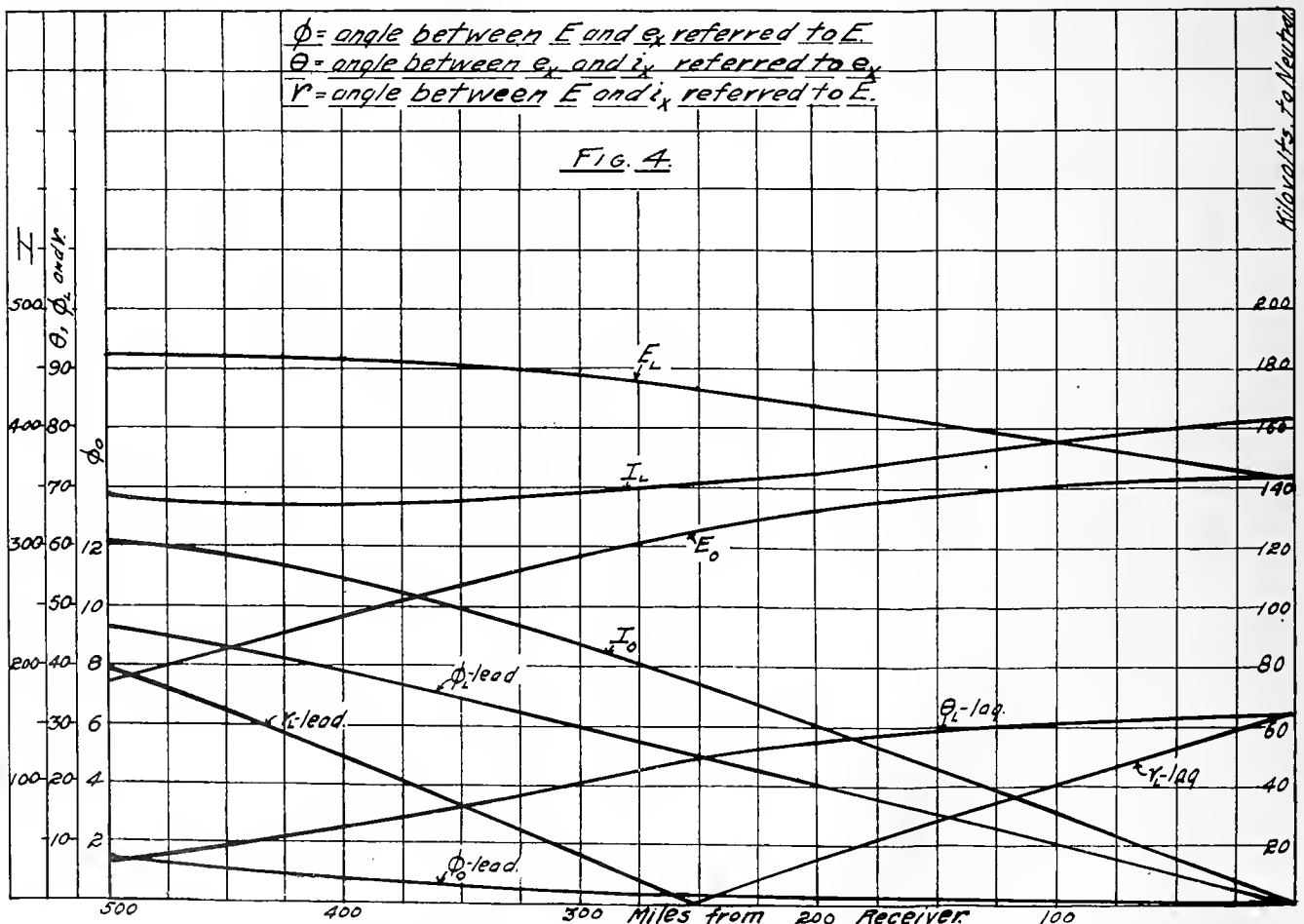


Fig. 4. Chart showing Charging Current at Various Points in the Transmission System

$$\begin{aligned}
 &= (347 - j214) (.514 + j.068) + (361 - j70.4) (.0410 + j.844). \\
 &= 267.9 + j215.6 = 341 \text{ amps.} \\
 &V = 39^\circ. \\
 &\theta = 7^\circ 8' = \angle 7^\circ 8'.
 \end{aligned}$$

Thus at full load the generator current lags the generator voltage $7^\circ 8'$ while the generator current leads the receiver voltage 39° . The full load values of current, voltage and Φ , V , and θ have been computed and plotted in Fig. 4 from which much interesting information can be drawn. For instance the receiver current is greater than the current put into the line by the generator.

This set of curves also shows the need of synchronous condensers at the receiving end of the line. Also it furnishes a means for determining the conditions necessary in order that this line may be paralleled with another line at a point say 300 miles from the receiving end. Thus without regulation such a line would be subjected to voltage variations of 60,000 volts (line to neutral). By assuming different condenser capacities at the receiver the proper capacity for keeping the voltage at the tapping in point within the desired limits can readily be determined and the complete characteristics of the line under these conditions determined.

In the case of the line as assumed with no power-factor correction the efficiency and power-factor at the generator are,

$$\text{Efficiency of line} = \frac{150,000}{185,000 \times 3 \times 341 \times .992} = 80\%$$

$$\text{Generator Power Factor under no load} = \cos 69^\circ = .358 \text{ leading.}$$

$$\text{Generator Power Factor under full load} = \cos -7^\circ 8' = .992 \text{ lagging.}$$

While the hyperbolic functions are very useful in the investigation of the case shown their field is by no means limited to this and a very important field in which they may be employed with profit is in the higher frequencies met with in telephone and telegraph work. As an illustration the following problem will be of interest:

Given a telephone cable of the following constants:
 $R = 88.4$ ohms per loop mile.
 $C = .055$ m.f. per loop mile.
 L and G negligible.
 $f = 1000$, so $w = 6280$.

Length of cable 10 miles.

Required the voltage and current at the sending end when the receiver current is 1.25 milliamperes.

$$m = .174 \angle 45^\circ = .123 + j.123.$$

$$z_0 = \sqrt{R/j\omega C} = 505 \angle 45^\circ = \text{surge or sending end impedance.}$$

The impedance of the receiving instrument z_r for different currents is given in Table II.

Current in Milliamperes.	Impedance.
1.0	850 $\angle 66^\circ 40'$
2.0	900 $\angle 67^\circ 25'$
4.0	975 $\angle 68^\circ 5'$
6.0	1030 $\angle 68^\circ 15'$

Equations may be derived for this problem as follows:

$$z_1 = \text{final sending end impedance} = e_1/I_1$$

$$= z_0 (z_r \cosh ml + z_0 \sinh ml) / (z_0 \cosh ml + z_r \sinh ml).$$

$$z_2 = \text{final receiving end impedance} = e_1/I_2$$

$$= z_0 \sinh ml + z_r \cosh ml.$$

$$I_1/I_2 = \cosh ml + z_r/z_0 \sinh ml.$$

$ml = 1.23 + j1.23$ and from charts, Figs. 1 and 2 we have

$$\cosh ml = .62 + j1.50 = 1.62 \angle 67^\circ 33'.$$

$$\sinh ml = .52 + j1.78 = 1.86 \angle 73^\circ 43'.$$

$$z_r = 860 \angle 66^\circ 54'.$$

$$z_r/z_0 = 1.7 \angle 111^\circ 54'.$$

$$z_0 \sinh ml = 505 \angle 45^\circ \times 1.86 \angle 73^\circ 43' = 938 \angle 28^\circ 43' = 823 + j450.$$

$$z_r \cosh ml = 860 \angle 66^\circ 54' \times 1.62 \angle 67^\circ 33' = 1395 \angle 134^\circ 27' = -995 + j978.$$

$$z_0 \cosh ml = 505 \angle 45^\circ \times 1.62 \angle 67^\circ 33' = 818 \angle 22^\circ 33' = 756 + j314.$$

$$z_r \sinh ml = 860 \angle 66^\circ 54' \times 1.86 \angle 73^\circ 43' = 1600 \angle 140^\circ 37' = -1238 + j1015.$$

$$z_0 \cosh ml + z_r \sinh ml = -482 + j1329 = 1413 \angle 109^\circ 54'.$$

$$z_2 = z_0 \sinh ml + z_r \cosh ml = -172 + j1021 = 1036 \angle 99^\circ 32'.$$

$$z_1 = 505 \angle 45^\circ \times 1036 \angle 99^\circ 32' / 1413 \angle 109^\circ 54' = 371 \angle 55^\circ 22'.$$

Then numerically

$$e_1 = I_2 z_2 = .00125 \times 1036 = 1.295 \text{ volts effective.}$$

$$I_1 = e_1/z_1 = 1.295/371 = .00347 \text{ amperes.}$$

$$I_1/I_2 = .00347/.00125 = 2.77.$$

Again we find these functions useful in the solution of problems involving the sag of cables. The equations of the catenary, which curve is followed closely by a flexible cable hung between two supports are,

$$s/c = \sinh x/c.$$

$$y/c = \cosh x/c \text{ wherein } s = \text{length of arc from lowest point to support.}$$

$$c = H/w.$$

$$w = \text{weight per unit length.}$$

$$H = \text{horizontal tension at the lowest point.}$$

Problem: A flexible conductor whose length is 30 ft. is suspended between two points 20 ft. apart in the same horizontal.

Find the depth of the lowest point.

$x = 10$ and $s/c = 15/c$ so let $10/c = u$ and we have $1.5 = \sinh u$ and from the graph of $y = 1.5 u$ and $y = \sinh u$ (Fig. 3) we find that $u = 1.6$ nearly or interpolated from tables $u = 1.6221$.

$$\text{Then } c = 10/u = 6.1649.$$

$$y/c = \cosh 10/6.1649 = \cosh 1.6221 = 2.6306.$$

$$y = 6.1649 \times 2.6306 = 16.2174 \text{ and required depth is } y - c = 10.0525 \text{ ft.}$$

In the solution of problems met with in certain beams these functions are very convenient as shown in the following example.

A beam built in at one end carries a load P at the other end and is subjected to a horizontal tension Q applied at the same point. Find the equation of its neutral surface and the deflection for a given load and tensile force.

The fundamental equation of such a beam is well known and is $EI \frac{d^2y}{dx^2} = M = Qy - Px$ which may be written,

$$\frac{d^2y}{dx^2} = n^2 (y - mx) \text{ wherein } m = P/Q \text{ and } n = Q/EI.$$

Let $y - mx = u$ and $\frac{d^2y}{dx^2} = \frac{d^2u}{dx^2}$ and we have $\frac{d^2u}{dx^2} = n^2 u$

and solving this equation for u

$$u = A \cosh nx + B \sinh nx \text{ or}$$

$$y = mx + A \cosh nx + B \sinh nx.$$

Now at the free end

$$x = 0 \text{ and } y = 0 \text{ so } A = 0 \text{ and } y = mx + B \sinh nx.$$

$$\frac{dy}{dx} = m + nB \cosh nx \text{ but at the fixed end } \frac{dy}{dx} = 0 \text{ and } x = 0.$$

$$B = -m/n \cosh n1, \text{ so we have}$$

$$y = mx - m \sinh nx / n \cosh n1 \text{ is the equation of the neutral surface.}$$

Now to find the deflection of the loaded end let $x = 1$ and $y = m1 - m/n \tanh n1 = m (1 - 1/n \tanh n1)$.

Given: A cast iron beam 2" x 2" section and 5' span built in at one end carrying a load of 100 lb. at the other and subject to a horizontal tension of 8000 lb. applied at the point of load. Find the deflection of the loaded end.

$$I = 4/3$$

$$E = 15 \times 10^6$$

$$Q = 8000 \quad y = 1/80 (72 - 50 \tanh 1.44)$$

$$P = 100 \quad = 1/80 (72 - 44.69)$$

$$n = 1/50 \quad = .341 \text{ inches.}$$

$$m = 1/80$$

The charts attached are not original but will be found in more or less complete form in several of the bibliography references with complete details for their solution. Drawn to the proper scale for the problem under consideration they form a very rapid and accurate substitute for the published tables which must be interpolated for values not tabulated.

For values of $\cosh x$ and $\sinh x$ greater than published in the tables they may be computed to any desired accuracy by means of the series.

$$\cosh x = 1 + x^2/2 + x^4/2 \times 3 \times 4 + x^6/2 \times 3 \times 4 \times 5 \times 6 + \dots$$

$$\sinh x = x + x^3/2 \times 3 + x^5/2 \times 3 \times 4 \times 5 + x^7/2 \times 3 \times 4 \times 5 \times 6 \times 7 + \dots$$

or if tables of e^x and e^{-x} are available they may be computed from the formulae,

$$\cosh x = 1/2 (e^x + e^{-x})$$

$$\sinh x = 1/2 (e^x - e^{-x})$$

Excellent tables of complex hyperbolic functions are given in numbers 2, 5, 9, and 10 of the bibliography and very complete tables of all the natural functions and e^x and e^{-x} , as well as many other valuable tables are given in 4.

Many other illustrations could be given of the use of hyperbolic functions in the solution of engineering problems if space were available but the ones given will show enough of the advantages of the method to bring out the value of this branch of mathematics as a tool for engineers in the solution of many otherwise very tedious problems. It is hoped that these illustrations will arouse the interest of engineers more generally to a use of more of the conveniences of the different branches of mathematics available.

Any engineer by the study of the references listed in the bibliography attached can acquire a working knowledge of the use of these functions and will in certain problems save a great deal of work thereby.

Bibliography

1. Pender: "American Handbook for Electrical Engineers." John Wiley and Sons.
2. McMahon: "Hyperbolic Functions." John Wiley and Sons.
3. Fleming: "The Propagation of Electric Currents in Telephone and Telegraph Conductors." Van Nostrand.
4. Smithsonian Mathematical Tables—"Hyperbolic Functions."
5. Kennelly: "Tables of Complex Hyperbolic and Circular Functions."
6. Kennelly: "The Application of Hyperbolic Functions and Electrical Engineering Problems." (This has fine Bibliography).
7. Kennelly: "Trans. A. I. E. E., Vol. X, p. 175, April, 1893. Impedance."
8. Macfarlane: "Trans. A. I. E. E., Vol. XIV, p. 163, 1897. Application of Hyperbolic Analysis to the discharge of a Condenser."
9. Miller: "Hyperbolic Functions and Their Application to Transmission Line Problems." G. E. Review, April, 1910, p. 179, p. 241-264.
10. Cohen: "Calculation of Alternating Current Problems." McGraw.
11. Steinmetz: "Engineering Mathematics." McGraw.

THE BRIGHTNESS OF TUNGSTEN FILAMENTS

The appearance of the spiral filament of an incandescent tungsten lamp presents an interesting problem in radiation. The inside of the turn in the helix is much brighter than the outside. Measurements of the brightness of the two made with a photometer, using a gas-filled lamp showed that the interior of the wire was 1.87 times as bright as the outside of the wire. Opinions however, differ as to the cause of this difference in brightness, but experiments carried out at the Bureau of Standards by W. W. Coblentz, which will be published as Scientific Paper No. 300 show that the increased brightness of the interior is produced by the multiple reflection of light from adjacent turns of wire.

It was at one time believed that the difference in brightness might be due to a difference in temperature, but the work of Worthing upon the heat conductivity of tungsten and the work of Langmuir show that this is not a possible explanation. The latter found that the temperature difference could not be greater than 5 deg. C., whereas a difference of about 200 deg. C. would be necessary in order to account for the observed difference in brightness.

The reflecting power of tungsten is lower in the blue end of the spectrum than in the red, hence the intensity of light emitted by one turn of the helix and reflected from another turn is more depleted in the blue than in the red. Multiple interior reflections would thus cause the color of the light from the interior to be redder than that from the exterior. The latter would be relatively more intense in the blue. The difference in this respect is so small however, that special care would be required to observe the effect.

The filament in a gas-filled lamp is wound helically in order to reduce the loss of energy by conduction and by convection. Ordinarily the efficiency of a source of light is increased by decreasing the infra-red radiation. In this case a helical filament has its luminous efficiency reduced by making the radiation from the interior more nearly the same as that from a black body, but the advantage gained by cutting down the losses of energy by conduction and convection more than counterbalances this effect, so that there is a net gain in efficiency.

GEMS OF SALESMANSHIP

BY CHARLES M. SCHWAB

(In speaking recently before the annual meeting of the world's congress of salesmanship at Detroit on the subject of super-salesmanship the chairman of the Board of the Bethlehem Steel Corporation uttered some notable gems on salesmanship that may well be borne in mind by men of the electrical industry throughout the West.—The Editor.)

The highest salesmanship consists in making a buyer understand the true merits of the article you are seeking to sell. My experience has taught me that the effort to make a man buy something he does not need in the long run defeats its own purpose.

The great salesman must have profoundly at heart the interests of his customer, for no business can develop except as it promotes the interests of those who use its goods or its services. In salesmanship the greatest possible unselfishness is the most enlightened selfishness.

The super-salesman will not only study the immediate needs of his customers but he will provide against those needs even before the customer realizes that they exist.

Business must be profitable if it is to continue to succeed, but the glory of business is to make it so successful that it may do things that are great chiefly because they ought to be done.

I have had some experience as a salesman, and I have found that it is a great deal easier to sell a big thing than to sell a little thing. It was easier to sell the Carnegie Steel Corporation to Mr. Morgan for \$500,000,000 than it would be to sell a \$100 piano to a farmer who was not interested in music.

One of the greatest elements of skill in a salesman is to create in the mind of the customer the thought that the salesman will in fact be able to produce the goods which he is trying to sell. The samples may be fine, but the customer must know that the man in the factory behind the samples will also do his part to the uttermost.

The supreme salesman, furthermore, must be a man who can not only make the customer want to buy, but who can also make the salesman's own producing organization equally enthusiastic to deliver the goods.

That is something new in salesmanship. I may induce you to buy large quantities of goods from me, but unless I can induce my organization down to the humblest workman, to want to produce those goods, economically and efficiently my skill in selling you the goods is wasted.

It is easy enough to sell goods if the price is made very low. Good salesmanship means getting a good price for good material. I make it a point in our companies to have the salesman personally participate in the profits based on their individual sales. It is not always the best salesman who sells the greatest quantity of goods, but it is the best salesman who sells the greatest quantity at the best price.

The opportunity for the salesman in that new world which will confront us at the close of the war will be one of the great openings of all history. Up to now we have been largely concerned with our domestic problems both in politics and in business. The end of the war will find us engaged in world politics, in inter-

national trade, and in world affairs on the largest possible scale.

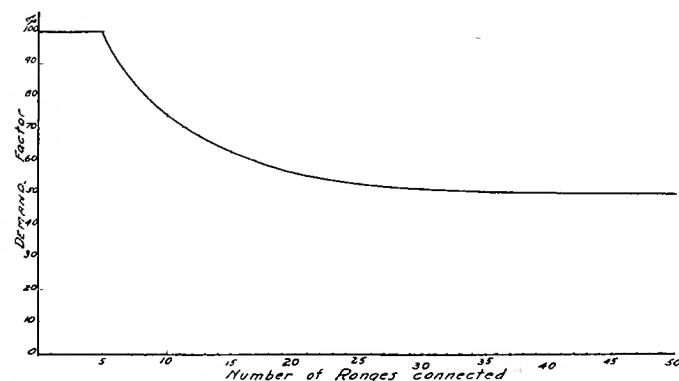
We should prepare to carry American methods and American ideals to all parts of the world to build and to develop. This war is going to result in the world moving forward in a few years as much as ordinarily would require centuries. Of this vast expansion of world effort and energy I predict that the steel business will form the basis just as it has been the basis of our own national development in the past twenty-five years.

The salesman of the future will not be merely contented to triumph over his competitor. We are entering an era of co-operation where we are beginning to see that the success of any business does not consist in failure of its competitors.

The super-salesman is a man true to the interests of his customer and whose supreme purpose is to quicken the imagination of his customer and make the customer see the true virtues of the goods the salesman is selling; the super-salesman foresees the needs of his customers and provides against those needs in full faith that the event will justify his foresight; the super-salesman puts his ideals above his profits, in full confidence that profits will surely accrue to fine ideals intelligently executed; the super-salesman places his all at the disposal of his country in its hour of need and now looks forward eagerly to the coming of peace and the opening of the greatest era of constructive effort and rapid development of civilization which mankind has ever known.

A DEMAND FACTOR CURVE

This demand factor curve for determining the size of electric range feeders in buildings, has been adopted by the electrical board of appeals of the city of Portland, Oregon, as part of the electrical ordinance, on



March 10, 1917. This is the first attempt by any municipal electrical department to depart in a scientific way from an arbitrary cut on feeders of this character, while a great majority still demand full connected load. This curve was based upon test data and a large factor of safety has been used to insure ample capacity at all times.

EYE INJURIES AND THEIR PREVENTION

BY JOHN R. BROWNELL

(Eye injuries and their prevention is a subject of growing importance among all the industries of the West. Engineers and central station managers are constantly coming face to face with accidents which under proper and scientific care could be avoided. Here is an excellent article on certain phases of accident prevention written by the Superintendent of Safety for the California Industrial Accident Commission that should prove of timely interest to all engaged in the up-building of industrial life in the West.—The Editor.)

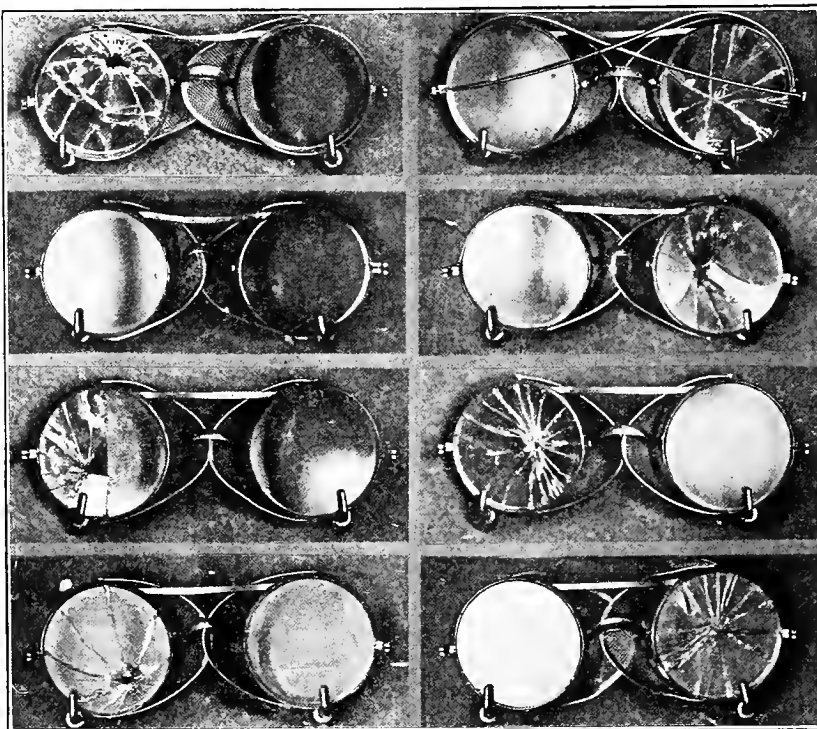
A workman was once asked, "Would you willingly allow your small son to throw pebbles at your face and then expect to dodge them, if he were right in front of you?" "Why, no; of course not," he replied; "He wouldn't try it more than once!"

And yet that same workman was daily subjecting himself to the chance of a far worse bombardment of steel chips, for he was operating an air hammer in a steel foundry. He had been provided with "chipper's" goggles to protect his eyes, but carried them in his pocket or on his cap rather than endure the slight discomfort of wearing them. The attitude of that workman is not in any way out of the ordinary, for it is the standard frequently taken by men subjected to the "eye hazard." The records of the Industrial Accident Commission show that in the year 1915 there were, in California, 6807 reported injuries to the eyes of workmen. Of this number 175 caused loss of sight or total loss of one or both eyes.

The problem of getting workmen to protect their eyes is not an easy one. The criticism very often is given by the men themselves that they cannot properly see their work if they wear goggles. Sometimes the work is of such a nature as to cause fogging of the glasses and consequent blurring of the vision. Then, again, there is present a fear that if the glass should be broken by some flying particle, it would enter the eye and cause a worse injury than that which would result from the particle itself. In answering this it can be said that in a large number of instances which the writer has known of personally, where the glass was cracked or shattered, only one or two resulted in any glass reaching the eyeball, and in no case did it

result in more than a minor injury to the wearer.

It is reasonable to assume that there is a definite time interval between the instant of contact with the



A SILENT ARGUMENT FOR EYE PROTECTION

These goggles were worn by steel riveters and chippers. In each case where the glass was cracked or broken out there was no injury to the eyes of the wearer.

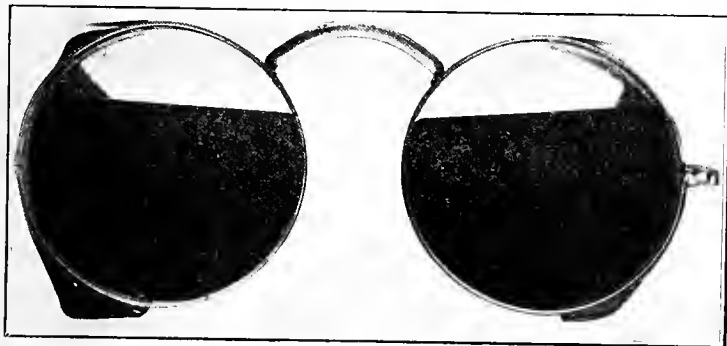
glass and the time when any flying particle of the broken glass could reach the eye, and it is a fairly well established fact that in the brief period following the blow on the glass, the eyelid automatically closes by reflex action of the muscles. The construction of the glasses is often such that it actually causes the glass to fly outward and away from the face when it receives a blow sufficient to break it. There are hundreds of broken goggles to be seen which were cracked in dozens of pieces, and which doubtless saved the eyes of wearers, where the glass can readily be

pushed "out," but where it is beyond the strength of most hands and fingers to press the glass "in," as there is present a distinct and valuable arching or cantilever effect of the glass as arranged in the rims.

There are many ways in which eye injuries are caused. Probably the most common are those due to small flying particles. These may be broken pieces of drills, chisels, hammer heads, etc., pieces of metal resulting from chipping or from milling machines and lathes of the high speed type, from particles in grinding wheel operations and stone cutting. Nails sometimes fly when struck and cause nasty eye injuries.

Chemical fumes are responsible for many cases of lost eyesight. Ammonia fumes and fumes from bromine and chlorine are apt to cause excessive "watering" of the eyes and result in the sufferer's walking into some dangerous place with a resulting injury more or less serious.

Workmen should receive special protection in the

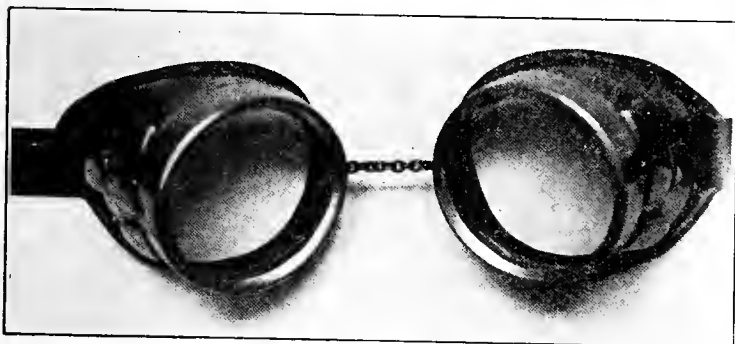


These are of cobalt blue with clear glass in the upper part.

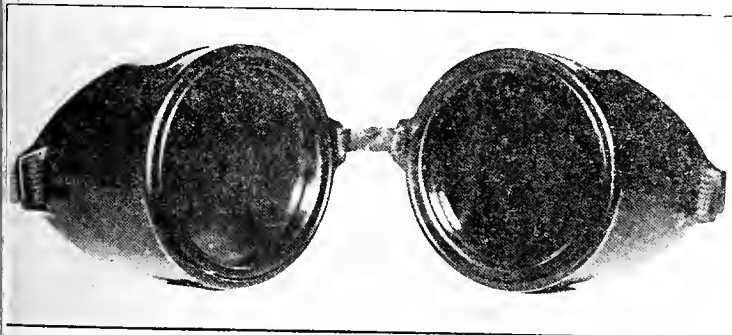
The lower part is used when looking at the molten metal.



These are worn as protection against acids, fumes and smoke.



Where there is danger from flying metal, rock and wood splinters these goggles are used.



ay of soft rubber-rimmed glasses when working in good alcohol fumes, as total loss of eyesight often allows continued exposure to them. Chemical fumes could be eliminated as far as possible, or gas tight helmets or goggles be worn by those compelled to work in such places.

Burns are responsible for eye injuries where goggles or masks are not worn by workers around molten



This mask is made of fine mesh screening with large glass covered spaces. The inside is arranged to fit on the head like a cap or a baseball mask.

metal and liquid glass during the manufacturing process. Many a man has lost his eyesight when pouring babbitt. This hazard is so clearly recognized that regular "babbitting masks" and helmets are now on the market.

The selection of lenses is of prime importance, as different kinds of work require distinctly different grades of lenses. There is no economy whatever in using ordinary cheap glass, for when struck it will be apt to shatter and fly. Specially annealed glass, carefully ground, is now provided in the best makes of goggles. There are two things in general to be considered in choosing lenses, namely, the thickness and color. It is a mistake to require thick lenses to be worn by grinders, but it is essential that tough, heavy lenses be used by chippers. Unprotected eyes of grinders are subjected to a constant fusilade of fine particles which often cause inflammation, accompanied by severe pain. When small particles are removed from the eyeball a minute cut often results, which in turn leaves a scar. If these become numerous enough they will fog the vision and serious impairment of sight will result.

Electric arc welding requires the use of lenses combining both blue and red glass. These absorb the harmful ultra-violet rays of the arc and tend to diminish the so-called infra-red or heat rays. Proper selection of lenses will prevent serious eye burns which sometimes develop several hours after the unguarded eyes of the welder are subjected to the rays. The pain is very severe and cases have been known to develop into blindness.

The workman's objection to wearing goggles is the problem which the employer should and can over-

(Concluded on page 34)

POSSIBILITIES OF INDUSTRIAL ELECTRIC HEATING

(The application of heat energy in the industries by means of electricity has an ever brightening aspect in the West, where constantly unfolding opportunities offer new incentives for industrial development. Here is a discussion on industrial electric heating by a group of prominent men in the electrical industry which deals with many new and interesting phases of this subject. This discussion is the stenographic report on this subject at the Riverside convention of the Pacific Coast Section, N. E. L. A., April 19-21, 1917.—The Editor.)

Chairman S. V. Walton: Yesterday's meeting was so short that we did not have time to finish the three subjects set, and we will start this morning on the paper on "Industrial Heating," which has been prepared by Mr. Holloway of the San Diego Consolidated Gas & Electric Company, and printed in full in the Journal of Electricity of April 15th. Mr. Holloway will not attempt to read the paper; it is hardly necessary to really abstract the paper; but I will ask him to start the discussion on the subject.

Six Reasons for Industrial Electric Heating Development

A. E. Holloway: Chairman and gentlemen—In discussing industrial heating, there are just two points which I want to bring out at this time. I believe we will agree that the industrial heating field offers great opportunity for increasing station load, but it is probably the most difficult field to develop.

In this paper I have given six reasons why it is very difficult to develop. The first point which I want to bring out at this time is the fact that each installation is an individual problem and must have individual attention from

harm to the industrial heating than if he had not made such recommendation.

The second point I want to bring out is the impossibility of standardizing apparatus or devices. A device successfully operated under one kind of work may not be applicable to the same kind for a similar manufactured product in another establishment, due to difference in size, degree of heat, etc. We have a few standard articles made by the manufacturers which we can promote at this time, but as a general thing, the industrial heating does not lend itself very well to standard apparatus, and it is necessary that the salesman of industrial heating be familiar with making installations of this kind.

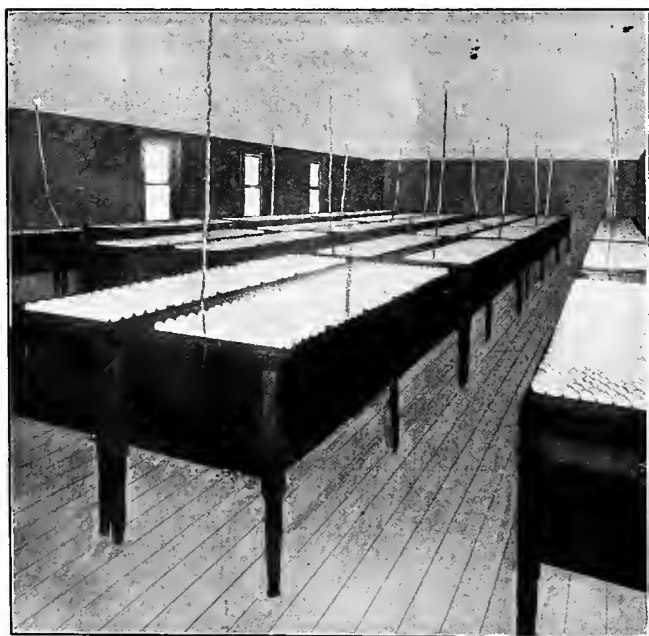
Along this line, I would suggest that the power companies could do a great deal of good by giving as much publicity as possible to each installation they put in. This publicity should not be general but it should be a detailed description of the construction of the apparatus, the size of the heating elements, the amount of heat required, and the amount of work done,—depending on the kind of an installation. I think each power company could do good work in giving to other power companies the results of their work on these problems so that each power company would not be required to cover the same field and work this out again.

The electric bake ovens in many cities are proving to be very successful, and I understand they are even getting electric baking at a very good rate for the simple reason that they get better results because they get the proper heat. I believe there are some here who are familiar with electric bake ovens and the installation of them, and I would like to hear from them during this discussion.

Chairman: There is no doubt on the part of any one who has given the subject any study, that the industrial heating load, which the central stations have not developed at the present time to any extent, is a big thing for the future. With the exception of a few furnaces, a few bake ovens and a few of one-thing-and-another, there are a very small number of really industrial heating loads on central station lines. I do not know what the reason for that is; probably because it is something that is rather new and requires more study. In addition to the thoughts already brought out by Mr. Holloway, I want to digress a little to the electric vehicle line. It is not an industrial heating load, but it comes, you might say, in a class of industrial uses of electricity, and also we ought to have some discussion on the subject of electro-chemistry. On the Pacific Coast we are hearing a good deal now of the electro-chemical business, some of the companies having some installations that are working out quite successfully. We are having a good many applications. This class of business seems to require a very low power rate. I would like to see the discussion started on this general subject of industrial applications, we might say, of electricity, rather than confine it purely to the industrial heating.

Electric Drying, Humidity Controlled

W. S. Leffler: Before passing from the discussion on electric heating, I would like to mention the development of a new type of electrical load which is so closely related to electric heating that it might well be called the brother of the industrial heating load. This is the electric drying or humidity maintenance load. That is, I distinguish between electric heating, thermally controlled, which has just been discussed, and electric drying, humidity controlled, which I wish to bring to your consideration.



Forty Thousand Eggs in a Single Hatch Accomplished Electrically in California

the central station salesman. The power companies have not had the men nor the time to give industrial heating the attention that it requires, because it is very slow to develop. The power salesman is probably the man who is most in touch with the industrial end, and it is my opinion that, in developing the heating field, the power salesman should be the man to start it; that is, he should look among his power customers to find any cases where he can apply electric heating to an advantage.

It is necessary that the power salesman give each installation careful study, as he must be thoroughly sure in his own mind that what he recommends will be successful. If he makes an error in a recommendation, it no doubt will do more

Relative humidity, we recall, means the relative quantity of moisture which the atmosphere holds suspended at the different temperatures. Practically, we think of relative humidity as relative dryness. That is, the relative drying effectiveness of the air we may be using to extract moisture from the products we wish to dry.

The humidity control is effected by the operation of an electric hygrostat or humostat, which, as the name implies, consists of an electric control which is sensitive to the changes in the dryness of the air, just as a thermostat is sensitive to the changes in temperature. The hygrostat, once set to maintain a constant dryness, will then alternately divert the electric energy to the heating coils as the humidity increases, and to an electrically heated vapor-producing bath as the humidity decreases below the predetermined point at which the apparatus has been set.

The field of application of humidity control apparatus available to profitable central station exploitation is divided into two classes of work. First, purely drying problems, such as box drying, match tinder preparation, model and papier-mache drying, fruit, herb and vegetable dehydrating, and, in short, all present industrial heating applications where the problem is one of drying instead of heating or cooking; and secondly, humidity maintenance applications, such as is necessary in all color press rooms, tanneries, tobacco and herb-storing rooms, tea, coffee and spice storage lofts, and all industrial processes where rapid changes in the dampness of the atmosphere reduce the uniformity and quality of the product produced.

As a specific example of an application which would fall under the first classification, namely, a purely drying problem, I might briefly mention an installation of 40 kw. connected load which has recently been installed in the California Hawaiian Sugar Refinery's box-drying room at Crockett. The problem was one of drying the boxes in which powdered sugar was shipped from San Francisco to New York. If the boxes were dried too quickly, that is, exposed to air the humidity of which was too low, the boxes cracked and warped, rendering them useless for shipment of the finely powdered sugar. On the other hand, if the boxes were not sufficiently dried before being filled with powdered sugar, the sugar would absorb the moisture from the boxes and crystallize to a solid block, unmarketable upon arrival at its destination. In this application, that humidity which would dry boxes thoroughly and yet not too rapidly was finally determined, and the humostats set at this point (55 per cent humidity) automatically maintain, with phenomenal accuracy, the relative dryness of the air in the drying room, irrespective of outside atmosphere and weather conditions.

This installation, which has been operating for the past six months, has operated at a load factor of practically 80 per cent, based on connected load, which immediately establishes this business in terms of its value to the central station.

As an example of the second class, or humidity maintenance applications, I might mention the apparatus which is under construction for installation in a leather curing room of a large tannery. In this particular application it was found that every time the north wind blew, which meant that every time the humidity dropped below a certain point, the value of the hides tanned that day (some 1100 in number) decreased in value 70 cents per hide, which to the industrial engineer indicated that there was an available revenue varying from \$70 to \$100 a day which some central station could reclaim by the installation of humidity control apparatus if the latter could maintain a constant humidity irrespective of the rapid changes in atmospheric conditions caused by the prevailing north winds.

Accurate humidity maintenance is of even greater importance in every color press room, for in color press work we find that paper, being far more sensitive to humidity than to temperature, expands or contracts to such an extent under even a 10 or 15 per cent variation of humidity, that it is

not possible to make the several colors mesh unless the humidity is maintained to an accuracy of some 4 or 5 per cent.

The economy effected by the humidity control as compared to the old method of attempting to regulate humidity through the agency of a complicated series of temperature controls, at once manifests itself when we consider that on many cold, dry days the atmospheric humidity is sufficiently low to effect the necessary drying operations without the addition of any artificial heat, whereas the temperature control on a cold, dry day would operate the heating apparatus at full heat. On the other hand, on a hot, sticky day the humidity control will continue to introduce the artificial heat until the desired relative dryness is secured, irrespective of the high temperature which may be reached before the high natural humidity is overcome and the proper dryness reached. This means that, irrespective of weather conditions, the humidity control will always produce a uniform product at a perfectly uniform rate of production, which it is at once appreciated is the first essential to the success of any industrial application.

From the standpoint of the central station I do not hesitate to say that the field of application of humidity control apparatus available to profitable central station exploitation is as broad as the present field of refrigeration. The load characteristics produced by humidity control apparatus are, as has been indicated, just as desirable to the central station as the refrigerating loads, and the important point which I wish to make in concluding is that the value of the service rendered the consumer is so great that the present forms of power rates readily apply to this class of work, and it is therefore not necessary to develop an abnormally low rate in order to secure this most desirable class of business.

Chairman: This question of humidity control which Mr. Leffler mentions, detailing a number of installations that would be practicable, entirely left out the subject of the comfort of the people. Anyone who has been in a crowded church or theatre, with his head nodding, can realize there are possibilities for this humidity control where the comfort of the people is concerned, in addition to the purely commercial aspect of it.

G. B. McLean: Mr. Leffler, do I understand this humidity control is brought about by some other means than raising the temperature?

W. S. Leffler: No sir—if I may answer that, Mr. Walton. The humidity maintenance is effected by increasing the temperature of the air to a point where it retains suspended in it a greater quantity of water vapor and therefore extracts from the product to be dried the necessary quantity of moisture; but, on the other hand, as I have stated, when the humidity is too low, the control introduces water vapor through the agency of an electrically heated water bath.

G. B. McLean: Well, it is purely an electric heating proposition.

W. S. Leffler: Yes, Mr. McLean, an electric heating proposition, humidity controlled, however, and not temperature controlled.

Chairman: The circulation has a great deal to do with it also.

W. S. Leffler: Yes, the artificial circulation, motor driven, in some cases consumes an additional quantity of energy, which further increases the value of the resultant load characteristic to the central station.

H. S. Batchelder: As Mr. Leffler has brought this question up, I have a concrete instance of the Sperry flour and the Balfour-Guthrie people having considerable trouble, when wheat comes to the mill, due to moisture in the bags. It affects the weight and the quality of the wheat in some way. Would an application of that kind fit this installation, Mr. Leffler?

W. S. Leffler: It would, indeed, Mr. Batchelder. In fact, that is another one of the applications which further broadens the field, together with Mr. Walton's suggestion.

Electric Furnaces

Chairman: There are a number of other angles to the industrial uses of electricity that we have not touched. Mr. Kahn of Stockton has the reputation of having on his lines in Stockton more electric furnaces than all the other lines in California. Mr. Kahn, we would like to ask you to tell about the electric furnace situation as you see it from your installations in Stockton.

Samuel Kahn: We are serving two electric furnaces for the production of steel castings. One is a one-ton furnace; the other is a three-quarter ton furnace. In serving these furnaces we do not attempt to take care of them over our local distribution system, but build special substations for each installation, taking the energy at 60,000 volts and trans-



The Iron Smelter at Heroult, California, with 2400 kw.
Capacity, 20 Tons per Day

forming it down to 2300 volts in one instance and 11,000 in the other. The furnace comes equipped with special transformers which reduce the voltage again to about 100 volts. These furnaces are a difficult load to handle until you become acquainted with their operation,—not alone you, but the people who have them installed. Because of the nature of the load, in their initial operation you throw "dead shorts" on your system several times a day. Electric furnaces are built in single-phase types, two-phase and three-phase. We discourage anything but a three-phase furnace, so that we will have no unbalanced condition on our system. Now, an unbalanced condition does not make so very much difference on a furnace you get in the larger sizes, it might make a material difference unless your system is sufficiently large to take care of the varying loads.

We have recently entered into a contract, to become effective several months hence, for electrical energy to supply a 6-ton furnace. This will require 2000 horsepower. And you gentlemen can readily appreciate that a 2000 horsepower single-phase furnace would create a most unsatisfactory condition of unbalancing if a dead short were to occur, for in such event the demand increases from 300 to 400 per cent above normal.

The function of the electric furnace, as I stated before, is to produce steel castings. Heretofore, in Stockton, they

have been producing them by means of crucible processes, but on account of the increased cost of materials, especially the crucibles, electricity at 1 cent per kilowatt hour will produce castings for about 50 per cent of the present cost of crucible steel castings made under the old processes.

I cannot think of any further general remarks I would like to say, Mr. Chairman, on electric furnaces. I do want to say something about the commercial section, if you will allow me about two minutes.

Chairman: Yes, sir.

Samuel Kahn: It occurs to me that the commercial section of the National Electric Light Association is at this time the most important section. We are divided into four general classes, you might say, the engineering section, which takes care of production, another class of the engineering which takes care of distribution, an auditing section, and a commercial section. The commercial section is the one that meets the general public and has its peculiar problems to solve. The other three sections have, of course, their problems, and many of them are difficult, but they are problems which we can solve within our own circle.

The commercial section has to meet the public, has to convince them of the extraordinary uses of electricity, and the superior application of electric processes, and I think that no one of us can devote too much time or give too constant attention to the various applications of electricity and their various uses to the public in general. The field is becoming broader all the time, and these meetings are especially valuable when we can come here and let this meeting act as a clearing house, as it were, of our various ideas and our various applications.

Ed. Whaley: Can you tell me what is the load factor you get on that electric furnace on an annual basis?

Samuel Kahn: That is a difficult question to answer. Our experience with electric furnaces has been limited to some six or seven months. The load factor, I should say, for the first few months of operation, has been in the neighborhood of 25 per cent. The foundries that have these furnaces installed, however, are building up constant business—and some of them are now running seventeen hours a day and hope to run 24 hours a day. If a furnace would run 24 hours a day, it would not mean it would be in actual operation 24 hours, because there would probably be four hours out of those 24 hours you would be charging the furnace and tending to minor details in connection with the operation of the furnaces. I would say the maximum load factor under the best conditions you can get out of the furnaces would be in the neighborhood of 70 per cent.

Mr. Crane: What is the power factor of the furnaces you have? What is the rate upon which you get the business?

Samuel Kahn: We make a straight rate of one cent per kilowatt hour, delivered at 2300 volts, or higher. The power factor in first starting sometimes drops as low as 50 per cent. I would say an average power factor would be up around 80 per cent. Those are approximate figures, subject to correction, because we have not been operating long enough to know what an average power factor would be. These furnaces are good revenue producers. The three-quarter ton furnace we have installed brings in a revenue of \$700 a month, and the one-ton furnace brings in \$800 a month.

Chairman: What capacity in kilowatts is the three-quarter and what is the one-ton?

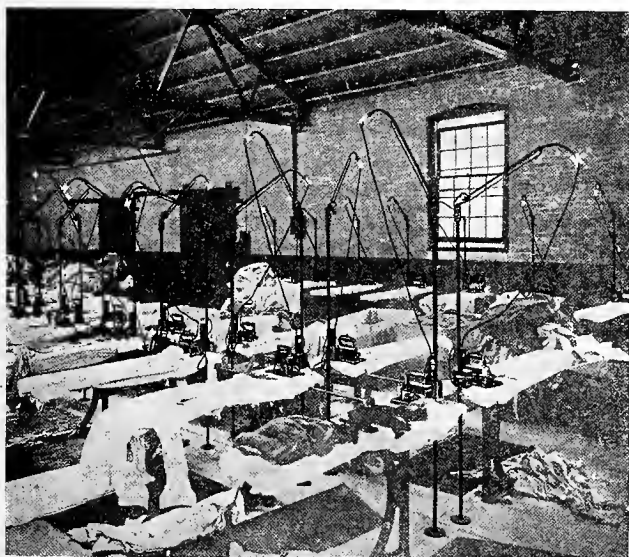
Samuel Kahn: The one-ton furnace is supposed to take 250 kw., and the three-quarter 175 kw. The six-ton furnace we will serve will probably bring us a gross revenue of \$60,000 a year.

Chairman: I might add in connection with that that he referred to kilowatts, and we must not forget that in taking care of this kind of service we must take care of the k.v.a.

Mr. Crane: I would like to ask Mr. Kahn if, in the rate, any consideration is taken of the power factor, if the power factor is made a function of the rate in any way?

Samuel Kahn: No. The power factor is not given any consideration, whatever, in making the rate. In making this rate it is like making rates for other applications of electricity, you have to make a rate that will get the business. And in making your contract, you can't lay too much stress on power factor, load factor, voltage variations, and the like, because a foundryman is not interested in that; he is interested in producing steel castings at the lowest possible cost, without any bother of the different electrical terms which might enter into a theoretically perfect contract.

Chairman: I think those who heard the rate discussion yesterday will agree right away with Mr. Kahn's brief words that we make the rates to get the business.



Typical Commercial Laundry Load, illustrating the Enormous Possibilities of Industrial Electrical Heating

W. M. McKnight: I have two electric furnaces in my district. One of them has just been installed and put in operation; the other one has been operating three years and is turning out four and five heats a day from 2:00 a. m. to 5:00 p. m. and has a monthly consumption of 150,000 kw.-hr. at present. The original installation was a Stassano furnace of one ton capacity with an energy demand of 300 kw. This furnace did not operate economically and was displaced by the present two-ton Heroult type. The energy is furnished through two 250 k.v.a. transformers, supplied from a 10,000 volt transmission line; this line supplying no other load because the furnace interferes with the line regulation. The power factor is good, but the load factor is poor. This is not given serious consideration in fixing the rates, because of the large kilowatt hours consumption and off peak load.

The furnace is charged with cold metal and the electrodes work down through the mass and when this caves in it short circuits the furnace and puts a big jog on the line. This is the reason this plant has an independent transmission line direct from the substation.

The second furnace will be supplied through three 250 k.v.a. transformers and will be a four ton furnace and will be charged with hot metal from the open hearth furnaces and will be a fine load. This is also a Heroult type furnace.

Mr. Kahn touched on one point that I have had in mind for quite a long time, that I wish to say a word on, and that is the matter of rates. Salesmen should not impress upon the consumer that he is selling electricity, but is selling service, and the service is more important than the rate. We ought not to have any rates for energy to sell. We ought

to sell service. Let the engineers fix the rates and we will just sell service.

It seems to me that the time is coming when every house, every suburban home we will say, will return to the central stations a revenue of ten dollars per month for service rendered, not electric energy sold. There is no reason why every home should not give us this revenue, and as our friend from Johns-Manville Company said, "they can put on a very efficient covering for their hot water boiler, but I assure you that if he will go a step further and supply the lagging with a good pink cover to match the ladies' dress, he will satisfy the consumer with service and she will pay the ten dollars revenue we want and get the service." (Applause.)

Chairman: I would like to ask Mr. Butte of the Butte Engineering Company of San Francisco, a contractor, to talk on this.

C. F. Butte: I notice Mr. Kahn stated he had considerable trouble in the short circuiting of the furnaces. I don't know who installed the Stockton furnace, but the way the furnace people furnish the equipment for the furnace, I don't wonder he has trouble with his line. The Pacific Gas & Electric Company has not had any trouble on their line since the furnace has been in operation, merely through the insertion of auxiliary apparatus and not depending on the breaking of the primary circuits, thereby preventing short circuits in the furnace that is installed. The transformer capacity is 300 kilowatts and the furnace is in operation 24 hours a day. It is working very satisfactorily from the furnace standpoint, but the people are experimenting, and they are having a little metallurgical trouble, which they expect to overcome.

And for Mr. Walton's information, another one is going in. The rate in this particular installation has not been established. They are awaiting developments and tests. I presume the power company will establish a rate very shortly.

In regard to the further application of heating, the match industry has awakened to the fact that the electrical process of drying their tinder instead of the steam is more economical. The Diamond Match Company, and another match company near Berkeley, have one equipment in operation and expect shortly to convert their entire steam drying processes; it has proven very satisfactory.

For the information of companies in the mining districts, the application of the electric relay heating in the air compressor lines may be of interest. At certain periods of the year some of the mines in Alaska could not operate until recently, for the reason that the air would cool off in their lines and the pressure would be so low at the hammer or the drill that they had to shut down. Merely through the insertion of heaters in the air line in relays of four to six hundred feet, and heating the air as it passes through the pipe, permits them to continue the operation in any kind of weather.

There is another application the power companies may be interested in, that is entering into refrigerating machinery, of raising the temperature of the mixture to a certain point as it comes through—I don't know the exact process, but we raise it from, I think it is, 22 to 36, presumably on the humidity process that we have heard from before.

But the electric furnace is something I think we all should watch very carefully and help along. We contractors come in touch with the consumers of the power companies and it is up to us to help this along, and we help them every opportunity we can get. We are depending upon the services and their connection, and for that reason we always help the power companies along in increasing the loads, incidentally increasing and expanding our own business. We are selfish in our motives, but we are generous in our method.

John Crawford, Jr.: What are they manufacturing in this business on the Pacific Coast, using an electric furnace?

C. F. Butte: It is a foundry and they are endeavoring to take nails, or any old scraps, and turn them into pig iron for casting work, bringing the material down for cast iron work.

They have been somewhat successful with their last lot. They are running 24 hours. And incidentally, for the information of the commercial men in case they have any other shorts on their furnaces, there is in development, an automatic control of the arcs so we will not have to have a man standing at the furnace all day long feeding the arc and creating the short circuits that were mentioned, because the short circuits not only occur, as Mr. Kahn explains, just through the carelessness of the operator, it is in the feeding of the arc that we become careless at times and bring them together.

Electric Enameling Ovens

Chairman: There is another angle of the industrial heating situation that we have not touched on in the discussion. That is in the enameling ovens for baking the enamel on automobiles. There are two or three manufacturers' representatives in the room who, I think, could discuss that and point out at least the volume of business of that sort that is at hand.

W. L. Boxall: We have in Los Angeles quite a large unit in the Ford assembling room, and I think I see Mr. Carr of the General Electric Company here and I believe he can give you a great many interesting details, if you wish to have them, in regard to that oven.

While I am on my feet, I would like to mention another use for electric heating, and that is the decrystallization of iron or steel. We have a plant on our system where they use the electric heat for heating up the oil well drilling pipe and they find it effects a great saving by their being able to use pipe over and over again that they would otherwise have to throw away for fear of crystallization. They also find that it is only the alternating current that will do that work; direct current of the same amperes would not decrystallize the pipe as well as the alternating. The power factor on that, I believe, runs about 40 per cent; it is about 300 kilowatts connected load, single-phase, in the experimental plant, and this looks as if the process is going to be commercially successful, in fact is now operating commercially.

C. T. Carr: There was a reason for the electric enameling ovens due to the high temperature which the Ford people found necessary to enamel their parts, and in using gas for generating heat they found that they had lots of explosions. Furthermore, unit cost is lower.

Mr. Leffler: While you are on the subject of automobile drying, may I ask, have you any information with reference to the success of it being applied to the acceleration of drying paints and varnishes having a turpentine base?

C. T. Carr: No, I have not.

Mr. Leffler: I have been recently conducting a series of experiments, using the application of ozone to accelerate the drying of turpentine base paints and varnishes. It normally takes varnish from two to three hours to set, but will set if exposed to ozone, in from 15 to 20 minutes' time. Of course, the electric load from the ozonator is practically negligible, but if the ozonator will increase the speed at which the paints dry, or if it will enable the drying temperature to be reduced, then electric heating can certainly be applied economically against any competing form of fuel heating.

C. T. Carr: I think that is a mighty good idea, because that is all that this drying business is, oxidation. If you can hurry it up a little bit, that cuts down the unit cost again and makes electricity more attractive.

W. S. Leffler: It is solely a question of ozonation. Have you any information upon that?

Chairman: No. Your question will go in the record, and if anybody knows about it, they will undoubtedly communicate with you.

C. F. Butte: Mr. Chairman, I am somewhat interested in the decrystallization of pipe. Did you get any information on what the current consumption per length of pipe was, or the current required, and whether it is actually successful?

Chairman: I suggest, Mr. Butte, for details like that,

you will get better results by taking it up direct with Mr. Boxall.

Miscellaneous Industrial Applications

Chairman: I think we all realize that the question of industrial appliances of electricity, particularly for heating, are wide and important, both from the central station point of view and the point of view of the distributors of electrical goods. I was pleased to have Mr. Kahn say that the N. E. L. A. commercial section, or the commercial committee, should be the clearing house for information of this kind as between companies and between manufacturers and companies. That is exactly, Mr. Kahn, what we are trying to make our commercial committee. We have made our recommendation to the executive committee, and as you are on that body, I hope you will try, when the question comes up, to make the commercial committee of permanent benefit to the whole industry. Did you want to say anything further on that point, Mr. Kahn?

Samuel Kahn: I haven't anything to say on that particular point, Mr. Chairman, although I fully agree with the remarks you have just made. However, I would like to make a recommendation, and would incorporate it in a resolution, if it is agreeable to this body, that at our next convention we endeavor to have at least one full day of discussion of topics of peculiar interest to the commercial section, and we will try to devote that day exclusively to those topics and not try to combine that with something else. I make a motion to that effect, Mr. Chairman.

Chairman: Mr. Kahn makes a motion that it is the sense of this meeting, the meeting of the commercial section of the Pacific Coast Section of the N. E. L. A., that at the next convention we have at least one entire day for the discussion of practical commercial subjects.

(The motion was duly seconded and passed.)

Mr. Mulgrew: Is any development, so far as any one here can say in electrical incinerators for crematories?

Chairman: Has there been any experience among the member companies with electrical incineration in crematories? I believe Mr. Furniss of the Pacific Gas & Electric Company at Oakland could tell us of an experiment we tried that did not work out successfully.

George B. Furniss: The crematory in Oakland undertook to follow the experiments conducted in the north, but on account of local costs and lack of faith in the appliance, the installation was changed to gas and fuel oil. The manufacturer refused to guarantee it, which seems to be characteristic. I say this with little restraint, as some manufacturers in putting out an appliance refuse to guarantee, yet will say, "In case the unit burns out we will replace it," but still at the same time won't say, "We guarantee to do it." Through lack of full guarantee, the local people hesitated to make further expenditures and resorted to oil and gas.

Chairman: Mr. Holloway, do you wish to say anything further in conclusion on the subject of industrial heating?

A. E. Holloway: I haven't anything further to say at this time, except to comment that most of this discussion has been on large installations. I believe we should not forget that there is a great field in smaller installations and small loads. I have tried to bring that out in my paper, and believe we should not only look to the large loads for building up our industrial heating, but to the smaller installations as well.

Chairman: I would offer the suggestion that those who are interested in the subject of industrial heating, in order to start out with the spirit of our meeting, communicate with the secretary's office as soon as you conveniently can, or when the spirit moves, telling of your own experiences in the various branches, and asking for information on any subjects that you wish information on. The secretary will then communicate with member companies to obtain this information. That will make the organization really useful.

ELECTRICAL PROBLEMS PECULIAR TO THE WEST

(Standardization of transformers, design of distribution systems, general safety orders for highway crossings, field testing of insulators, inductive interference, standardization of hardware, and a discussion of turbines for high head utilization are some of the electrical problems peculiar to the West. In this section of the country irrigation loads must be economically handled and large quantities of hydroelectric energies successfully transmitted over long distances at high voltages. Here is a timely discussion of many of these problems by a number of prominent electrical engineers which marks a distinct advance in electric distribution and design for the future. This discussion is taken from the stenographic report of the engineering section at the convention of the Pacific Coast Section N. E. L. A., Riverside, April 19-21, 1917.—The Editor.)

President R. H. Ballard: The subjects this committee has to handle are of the utmost importance to the industry and particularly to all operating under our Pacific Coast conditions. We have a thought that in this Pacific Coast section the engineering committee will be a strong-arm help to us. The next administration may find it advisable to permit this committee to continue research work which should prove of great benefit to us on the Coast. We have been fortunate in having as chairman of the committee one who has devoted a great deal of time to the subject, and who has now rounded out a program for your consideration. I have great pleasure in introducing to you at this time Mr. J. E. Woodbridge, chairman of the engineering committee, who will take charge of this meeting.

Enumeration of Peculiar Problems

Chairman J. E. Woodbridge: President Ballard, and fellow members of the Pacific Coast section: In your instructions at the time of the appointment of the engineering committee you, President Ballard, directed us to make a general survey of the engineering situation, with recommendations for future work. Not wishing to lay out a program for our successors that may be appointed on this committee, we have not followed those instructions precisely, but, so far as the future is concerned, we have already started several things that we could not finish, as will appear in the course of this discussion.

Before reviewing the engineering committee's work, I wish to make a parallel statement to that made yesterday by Mr. Walton in his opening remarks, in which he said that the selling end is of the utmost importance to the central station business. While it is true that if there was no power sold no engineering would be required, it is equally true that if there was no engineering in the central station business there would be nothing to sell; and I submit with the modesty that usually accompanies engineers' statements, that the engineering and sales ends are equally important.

Before the engineering committee was appointed and, in fact, before the Pacific Coast section was formed, the Apparatus Committee of the national body had undertaken to standardize the sizes, taps and other features of distribution transformers. Mr. S. J. Lisberger of the Pacific Gas and Electric Company was a member of that committee. He took the matter up with us at the time this committee was formed, and it became evident that it was rather difficult from this distance to express our needs with sufficient force before the Eastern committee. We therefore reviewed the situation, made our recommendations and Mr. Lisberger was sent East to voice our ideas there. The Apparatus Committee acted on and incorporated most of our suggestions and ideas, some of which were original with this section, and our representative was successful in getting standards that will be satisfactory in our work. You will hear later from Mr. Lisberger on this point.

One of the undertakings that we started and have not been able to finish is as follows: Shortly after the committee was appointed we found that the California State Railroad Commission proposed to revise its general order covering overhead line construction, to amplify the same, and make it constitute a complete safety code. We offered the engineers of the Commission our assistance in this matter

and this offer was accepted by the engineering department of the commission.

Another piece of work that we have started and have not been able to finish is the investigation of the deterioration of porcelain insulators, particularly of the suspension type. Considerable work along this line has been done by some of our engineers under the instructions of and with the assistance of Prof. Ryan of Stanford University and with the equipment of the high tension laboratories of the University placed at our disposal.

Another piece of work that is not as yet finished is the investigation carried on by engineers (including some of us) appointed by the California State Railroad Commission some four years ago to review and draw up rules on inductive interference. The Joint Committee on Inductive Interference is now engaged in drafting its final report to the commission. I say final. It is intended to be the final report of that committee, but it is not intended or expected to be final in any respect in the matter of evaluating all the elements involved in inductive interference. While we have been at it four years, such work will probably continue for several times that period before the investigation of inductive interference is brought to a basis of practice that will approach a standard.

Your Engineering Committee also set out to avoid a bad situation in connection with suspension insulators, which have been in the past fitted with various sizes of interconnecting hardware, many of which are not interconnectable with each other. We appointed Mr. Klauber a sub-committee of one to recommend a standard. Mr. Klauber has prepared a paper on the subject which has been published in our proceedings outlining the standard which he found had already been adopted by the manufacturers, and commenting thereon.

In the matter of prime movers we felt some diffidence in that other geographical sections have prime movers of much greater size and more highly developed than anything we need in this territory. I am speaking now of steam turbines. We, however, use water wheels to a very considerable extent, generally of the impulse type, and some of our companies have recently developed new plants with very high head turbine wheels. Among these companies is the Pacific Gas & Electric Company, and Mr. Jollyman has prepared a paper on this subject which has been published and will be open for discussion.

We have all become more and more interested in joint pole construction which we are using to a certain extent in the cities of this territory, but which apparently is now becoming advisable even in rural territory. At our request Mr. McDonald, secretary of the Joint Pole Committee of Los Angeles, has prepared a paper which has been published on this subject.

One of the most perplexing problems of the small as well as the large companies is the protection by fuse or otherwise of distribution transformers. Among our papers is a series of articles on this subject, concerning which there are many diverse views that may be brought out in its discussion.

Our use of steam turbines is usually and will be to a greater extent in the future mainly as stand-bys for hydroelectric power. This use is quite different from constant

operation with higher load factors and requires a different organization of the steam plant. We have a paper on this subject by Mr. Morgan of the Pacific Light & Power Corporation, and I know we have many ideas of value in this connection that will be brought forth in its discussion.

I wish to thank the other members of the committee for their cordial co-operation in getting together these papers in the short time that we have been working. I also wish to thank the engineers outside of the committee for their contributions, as we have acted on the principle of the good executive in getting somebody else to do the work in many cases. For example, the sub-committee appointed to assist in the revision of the safety code, consisting of Messrs. Lisberger, Quinn and Cunningham, is made up of men no one of whom is on the main committee.

We will consider first today the subject of standard distribution transformers, on which Mr. Lisberger can give us the main facts of the standards adopted.

Standardization of Transformers

S. J. Lisberger: Mr. Chairman and gentlemen. Engineers intimately connected with the design and operation of distribution systems know well the difficulties encountered in the operation of transformers of different ratios, such as have been manufactured by the several electrical companies.

Several years ago the National Electric Light Association undertook the standardization of voltages of transformers, in order to overcome the difficulties encountered. There existed at that time in the classes most generally used twelve different ratio transformers, where there normally should have been but three classes. That condition was far from ideal for the manufacturer and for the operating companies.

It was realized that the adoption of standards for this type of apparatus would be a great benefit to the manufacturers, as well as to the operating companies, and with this idea in mind the Apparatus Committee of the National Electric Light Association started the work in 1915.

The 1916 Apparatus Committee, of which the writer was a member, undertook the completion of the work and appointed a Western Sub-Committee, in order to obtain the ideas of the western companies. This Western Sub-Committee met early in November, 1916, and after a series of meetings in Los Angeles and San Francisco, the writer went east, appearing before the National Committee in New York in February, 1917, at which time the report (as published in the issue of "Journal of Electricity," June 5, 1917) was formulated.

Chairman Woodbridge: Mr. Lisberger has given us an outline of this work and its results. I want to call attention to one point. It may appear that the transformer that has a range from 5700 to 7200 volts is a complicated transformer. That transformer has only two primary taps, one cutting out 600 volts and the other cutting out 300 volts. You can cut out the 300 or the 600 or both. The range is largely obtained through a corresponding range of secondary voltage.

I believe it would be advantageous to get the views of the manufacturers on this matter. Mr. L. R. Brown, of the transformer sales department of the General Electric Company can tell us something of the advantages to the manufacturer, and as he has been around other parts of the country he has some information as to how other companies will fall in with this standardization.

L. R. Brown: I don't think I have much to add to what Mr. Lisberger has had to say on the subject. The manufacturers, I believe, are very pleased with the action of the National Electric Light Association on this matter. For years 2300 volt transformers had been standardized. Above 2300 every company adopted a standard that best met their conditions or that they thought met their conditions. As a result there has been no quantity manufactured, and practically all high voltage transformers, with the exception of the 6600 class, of the new standards, all lines up to 33000,

will be more or less on a quantity basis. Both the manufacturer and the consumer will profit by this quantity manufacture.

Chairman Woodbridge: In this section we are perhaps as much interested in local stocks as we are in the manufacturing problems, and I would like to ask Mr. W. P. L'Hommedieu of the San Francisco office of the Westinghouse Electric Company to tell us how this standardization will affect the local stock situation.

W. P. L'Hommedieu: One of the greatest problems in the distribution of transformers to consumers on the Pacific Coast is that of local stocks, since the manufacturer must be prepared, as far as is practicable, to fill all orders from Pacific Coast stocks. A considerable amount of money is therefore invested in these stocks.

The adoption of the proposed standards will affect this stock situation in two ways, and will benefit both the consumers and the manufacturers. At the present time the requirements of different consumers necessitate carrying in stock more than one line of voltage ratios for a given voltage class of transformer, with the result that stock carried for one consumer cannot be diverted to another.

After the adoption of the new standards, all stock carried will be available for any consumer.

Obviously, this will result in greatly improved service to consumers in promptly filling orders and at the same time will probably reduce the total stock requirements. This will reduce interest charges on stock, which will in turn have its bearing on the cost to the consumer.

C. O. Poole: I was very glad to hear Mr. Brown make the statement that they were including in their standards distribution transformers up to 33,000 volts. I was rather apprehensive that I would be left out in the cold. Mr. Lisberger has not made special mention of voltages of eleven or twelve thousand volts, and I would like to ask if the matter of 15,000 volts and up to 33,000 volts have not been standardized in size as well as voltages. In our district down here we have found it necessary to go a little higher than most other companies in the distribution voltages, owing to the uncertain distance we may be called upon to transmit. We have in our Imperial Valley district a standard distribution of 15,000 volts, normal rating, but our sub-station transformers are wound for 16,500 volts, so that we can take care of our drops for the outlying districts. I want to assure the manufacturers that our company will be very glad to fall into the standards suggested by this committee.

E. R. Northmore: I am glad that Mr. Lisberger brought up the question of three voltage secondaries, i.e., 110, 220, 440, and that a standard has been adopted.

The majority of the distribution transformers purchased by the Los Angeles Gas & Electric Corporation had the three voltage secondaries until the manufacturers made an extra charge for the extra voltage tap. We then made a careful check of all our transformers in service and found that less than one per cent of our transformers required the three voltages.

We now require three voltage secondaries on our larger sizes only, that is, all distributing transformers over 37½ kilowatt have the three voltage secondaries.

P. M. Downing: I have not read the paper that is being discussed this morning, and I do not know to what extent the standardization of equipment is being advocated. Personally, I am in hearty accord with the standardization idea. I think it is a good thing for both manufacturer and user. It should quite materially reduce the cost not only of transformers, but of all equipment because the manufacturers will be called upon to carry fewer types, sizes, voltages, etc. However, there is a possibility of over-standardization.

One speaker has said that by standardizing the manufacturers could reduce the stock they have to carry. On this point I cannot agree with him. My experience for the past few months has been that the manufacturers have not

any stock. We have been trying to get transformers of almost any size, voltage, characteristics, etc., for immediate use, but in most instances we have been advised that there were none in stock, and the best that could be done was several months' delivery.

With this situation confronting us it would seem that right now is the time for the manufacturers to standardize. They can sell anything they can deliver, regardless of size, voltage, etc. If they will stop manufacturing some of the odds and ends, they will find that the central station companies will be very glad to accept anything built according to this proposed new standard.

It is my understanding that th's report advocates standardizing all transformers regardless of size, voltage, etc. That I think is impracticable. On transmission lines you have so many conditions to meet that I think practically every bank of step-up or step-down transformers must be considered special. They must be designed to meet the conditions under which they are to operate; for instance, step-up transformers in a power house a long distance from the distributing center would necessarily have a different ratio of transformation from those at the step-down station at the distributing center. Those at the step-up end of the line need not have the same close regulation that is called for in those at the step-down end. You can always vary the bus voltage in your generating station through a considerable range to compensate for the poor regulation in the step-up transformers, but where you have a large number of step-down stations supplied from the line you cannot change the line voltage to offset the poor regulation of the step-down transformers. Another feature that makes transformers having poor regulation desirable in the generating stations is that they limit the strains thrown on the generating equipment by limiting the ratio of current when line troubles occur. So, as I say, I think the idea of attempting to standardize on all transformers is a mistake. I think the idea is an excellent one, and will result in a great deal of good.

I. B. Potter: I want to ask Mr. Lisberger if there is any provision for standardization of three-phase transformers in the 2300 volt class. That is, from 5 to 100 kilowatt three-phase transformers.

R. E. Cunningham: I should like to ask whether 50 cycle transformers will be special, or to what extent the new 60-cycle transformers can be used on 50-cycle circuits?

Design of Distribution Systems

H. F. Jackson: I would like to make a few remarks. It seems to me that closely allied to this subject of standardization of transformers is the study of the distribution line or distribution system. It has seemed to me that most of our trouble comes from the fact that we have such a wide range of distribution systems. Every company, with its own engineers, is working out a different system. I would like to suggest as bearing directly on this subject and as making the standardization of transformers practicable, that the various companies through their engineers see if we cannot adopt some better standards for distribution systems. For instance, in the rural districts, the question arises, shall we distribute directly from a 16,000 volt line or from an 11,000 volt line, or shall we run to a distribution center from which we will distribute at 2300 or 4000 volts? The tendency has been with our long lines to put a special transformer on to take care of some individual demand that is immediate, and gradually to allow a system to grow up by reason of these frequent individual taps on the supplying lines, so that we finally get, for example, to a 16,000 volt distribution rather than to a 16,000 volt secondary transmission from which to take off the distribution at central points. I mean to say that we are allowing the case of the special individual consumer to control the situation without looking forward enough to see when there will be two or three customers of the class in the same neighborhood and providing for the condition of the future—and not the distant future, but the reason-

ably near future—by taking care of a central district with a general step-down station to something like 2300 or 4000. Now, if we would all lay out our rural systems so that eventually the high voltage distribution lines will become secondary transmissions, and from those secondary transmissions lay out subordinate substations with a network of lower voltage radiating lines, we will save ourselves a lot of trouble in the future. That, in conjunction with the standardization of transformers, will perhaps make the problem of the big city tie in with the problem of the rural districts, which it does not do at the present time. I would like to urge in conjunction with this matter the careful study of the various engineers, of the distribution systems, primary to the fixing of the transformers.

Chairman Woodbridge: Mr. Jackson's remarks outline a good field for future study by the engineering committee. We seem to have two diverging tendencies in that respect. Mr. Poole speaks of distribution at 33,000 volts. Others who have been distributing at one-half that voltage are tending to use such lines as secondary transmissions and with real distribution at a lower voltage.

S. J. Lisberger: Answering Mr. Cunningham's question regarding the operation of the sixty-cycle standard on the 50 cycle circuits, would advise that the 60 cycle standards will operate satisfactorily at 50 cycles, but with slightly higher losses.

To Mr. Poole's question. The three voltage rating includes the 13,800 volt class, as well as the 2300 volt class, the 6900 volt class and the 11,500 volt class. The 11,500 volt class, the 13,800 volt class and the 16,500, 22,000, 33,000 and 44,000 volt transformers all have two 5 per cent taps on the primary.

With reference to Mr. Downing's discussion, it was realized that the standardization of distribution transformers would be of the greatest benefit. It was hoped, however, that in future work there would be a possibility of standardization of power transformers. The committee realized that many systems would require transformers especially designed but thought that if the voltages were standardized that engineers might make changes in the new system which would allow the use of standard lines, which would result in a lower price, as this standardization tended to materially reduce factory engineering and production costs.

The committee did not undertake in this work a standardization of the three-phase transformer, but that work is to be undertaken by next year's committee. Up to this time, however, the three-phase transformer has not been used in sufficient quantities to allow production on the quantity basis anywhere near comparable to the single-phase unit. This means that the cost of the three-phase transformer, as compared with the single-phase transformer, warrants careful consideration.

Mr. Jackson's remarks, pertaining to the design of distribution system, are interesting and demand consideration. Distribution systems are one of the most costly parts of our plant, and careful study is absolutely necessary for economic results. Much money can be spent in a distribution system with little to show for the expenditure and unless much care is given to the selection of a proper voltage, with due consideration given to the density of load, economical results will not be obtained. Or expressed in other words, it will often pay to supply a densely congested section at 4000 volts rather than at 11,000 volts, even if it be necessary to build an 11,000 volt line with small outdoor substations, stepping down to 4000 volts.

The taps on the 6900 volt class were designed not only to meet the demands required by the users of this new class, but to provide the taps that would give the same ratios as the existing class; this in order that the new class would bank properly with the existing class.

In closing I wish to call attention to the thought that prevails throughout the report, that the general adoption of

these standards will ultimately result in material economies to the users of this class of apparatus through reduction in manufacturing costs, elimination of many varieties of stock and improvement in deliveries and that it should be further borne in mind that there are many systems where transformer requirements will not conform to the standards listed and that it is not the intention that these recommendations should limit the use of any special transformers, but the specifications herein are the ideal towards which to work in designing new systems, or making changes or additions in existing systems.

General Safety Orders—Highway Crossings

Chairman Woodbridge: The next subject for discussion is the preparation of the General Safety Order. We can say little or nothing about our work on this until it is approved by the Railroad Commission. But I should like to have an outline of the proposed scope of the order from the commission's representative. I had hoped that Mr. F. E. Hoar, gas and electric engineer of the commission would be here, but in the absence of Mr. Hoar I will ask Mr. A. F. Bridge of the same department to give us some remarks on that matter.

A. F. Bridge: Mr. Chairman and gentlemen, at the present time the regulations and laws in this state covering safety of construction are more or less contradictory. They consist of the statute of 1915, known as chapter 600, enacted in 1911 and amended in 1915; the commission's general order No. 26, which covers the matter of clearances and safety of construction at crossings, highways and railroads, and the commission's general order No. 39 (which, while primarily and inductive interference order, also covers the protection of communication lines from contact with power lines at points of close proximity).

The commission has realized for some time the necessity of an order which would consolidate these various safety rules and laws and remove the contradictory portions of them, and, in view of the work done by the Bureau of Standards in evolving a safety code, we felt that the time was opportune to enact a general safety order covering pole line construction. The present rules, so far as I know, do not cover the matter of clearance above ground where lines are constructed on highways. It is obvious that the matter of clearance is just as important where a line is constructed along and over a highway as where it is constructed across it. It is contemplated that this matter shall be covered in this proposed safety order, and we hope to combine the various statutes and orders that are now in effect. In formulating this order we have asked the co-operation of the utilities which will be affected and expect that through informal conferences with engineers representing the various bodies, we can devise something which will be mutually satisfactory. The practice which has been generally adopted in such matters in the past has been for the commission or other regulatory body to draft a set of rules, call a public hearing and ask for comments from the interested parties. In a proceeding of this nature, where the interests of some of the parties tend to be opposed on some points, absolute co-operation and absence of bias is essential to accomplishing any results. To date we have been most successful in that respect, and although the work has not progressed very far as yet, having been started quite recently, before long we should have a safety order which will be acceptable to all of the wire line interests.

Chairman Woodbridge: In a matter of this kind I believe it is advisable to get the views of outside interests, and one of the interests outside of this organization that is affected is the railroad interest. I should like to ask Mr. Fred Geibel of the Southern Pacific Co. to give us his views as to what the general safety order should cover in the matter of railroad crossings. That is, power lines over railroad crossings.

Fred Geibel: We have at the present time two sets of specifications for overhead power line crossings, which con-

form as nearly as possible to the requirements of the several states through which we operate. There are practically two points to be considered in the construction of an overhead crossing: First, there should be a minimum number of wires over the railroad tracks, signal and dispatching systems; and second, the construction should be not only safe, but so constructed that structures adjacent to the tracks will fall away from the tracks in case of serious failure. Application for crossing agreements originate by the power company filing papers with the division superintendent. These papers with attached specifications and drawings are sent to the general office, San Francisco, for approval. While copies of our standard specifications are in the hands of all of the power companies, many crossings come through without sufficient information. Under such conditions it is necessary to hold up approval of crossings until complete data is received. Some companies have developed standard blank forms which provide space for all necessary detail information. This is a very excellent idea and is recommended for general use, as it insures against omissions of essential data. It is not necessary to show detail construction, but all points covered in the specifications, such as pole top diameters, cross-arming, insulators, size wire, etc., should be indicated. As a suggestion it is recommended that the committee standardize on letter-size for drawings attached to crossing agreements. The letter size is more convenient as the drawings can be easily filed with supporting papers. We are also interested in chapters 499 and 600 and general order 26, as affecting power distribution and trolley line construction. It is understood, however, that the several differences in the requirements of these regulations are now being considered by your committee.

Chairman Woodbridge: One of the objects of this work is to make the sub-committee a general clearing house for the power interests with the engineers of the commission that will draft the code, in order that there will not be a confusing number of criticisms or any conflicting criticisms. In order to carry out this work properly the sub-committee would undoubtedly like suggestions as to proper provisions for the code. It may not be the best time now to give such suggestions, but if anyone has any suggestions we would be glad to hear them.

C. O. Poole: To my mind there is a great need for the standardization of construction of railway and highway crossings. We have found that some of the railroads are rather stringent in their requirements. The Southern Pacific has been quite reasonable in exacting requirements for the strength of construction, etc., but other companies we have found have gone so far that they have more than doubled the size and weight of structure for the crossing, which is very expensive, and sometimes causes delay. Another point is in connection with what is termed highways and highway crossings, which is a pertinent factor in this order which you have under consideration. We had occasion a couple of years ago, where we had a 100-mile transmission line to construct, to make 100 highway crossings. That is to say, they were highway crossings according to the interpretation of the code. Each of these highway crossings would probably cost us \$100 more than the ordinary straight away construction would cost. The result was that we were in violation of the code in a great many cases. Some of the "highways" are nothing more than trails. Yet a wagon would probably go over them once a year or once a month. I think, therefore, it is quite important that the definition of what is a highway should be given.

H. F. Jackson: I don't know whether I am always taking exceptions to Mr. Poole's statements or not, but I have had a good deal of experience with this kind of crossings and I think there is no subject where perhaps lack of definite standards and lack of knowledge—that is, in reference to what we should do—has had more force than it has in this question of crossings. It has seemed to me that we have

leaned over backwards by reason of our lack of knowledge of what to do in an attempt to be safe. It is just as important that the crossing of a highway shall be safe as it is that that crossing over a railroad should be safe. It is as important that a line, running parallel to a highway, or a line running over a man's farm or his dooryard shall be safe as that it shall be safe on a highway or railroad. I believe the way to do this is to make all of our construction as safe as possible and to use good standard construction over all of these places. Make the standard construction right and put it up in good shape and as far as possible avoid special work for crossings. It is very difficult to say what does and what does not come under the order. It is difficult to say that a trail or a small road is not under the order. We are continually in trouble as to whether the crossing of a man's path shall receive the same consideration as the crossing of an important railway line like the Southern Pacific Company. I do not want to be understood as standing for anything except the safest possible arrangement for any railroad or any important highway, but I do ask that we shall not make too complicated a situation with regard to any of these matters. I believe that the doubling of insulators doubles the hazard. I believe if we put a lot of heavy insulators over the railroad line we are running the risk of doing more damage than good. I would therefore suggest that in considering this matter we consider it on the basis of making the whole line good, and avoiding special construction work. In studying this subject we should study it with a view to the economic as well as to the engineering side, giving both their proper weight, and then we should provide a structure that will be simple and avoid as much special work as possible.

A. H. Babcock: A railroad is supposed to have plenty of all kinds of standards for everything. We have been very glad to follow any standard arrangement on a crossing that will permit us to carry out our obligations to the public which are, in general, to transport people and things safely. It is difficult sometimes to make a power company see the justice and wisdom of certain requirements for a small line, unimportant to them but crossing one of our important tracks. It is difficult to make the power company realize that at such a crossing more protection is required. Interference with our signal system is a very serious matter, let alone the danger to the operators in the telegraph stations. We have had switch boards burned up. We have had stations burned down. We have had apparatus burned out for fifty miles on each side of one crossing simply by the failure of one transmission line. The failure of the signal system produces a stoppage of traffic which becomes serious at once; because a train is called upon to stop when the signal says stop, and it must flag over that block to the next signal if it does not clear within a certain specified time. So there is not only the destruction of expensive apparatus, but also delay to the traveling public. As for the physical hazard, it is as bad to have a telephone line drop down on a man on a box car as a 100,000 volt line. The other day I came out over the Santa Fe line, and as I watched that track from the rear end of the train I saw crossings of transmission lines put up in thorough workmanlike fashion and of a design that I think if my company had insisted on we no longer would have had a prominent power manager get up and call us reasonable. I will be glad to meet in conference to bring about a standardization of crossing designs. The sum and substance of my remarks is directed to the suggestion that we do get together in these matters. Although we are not members of your association, let us come in and let us discuss these things with you and see if we cannot reach a more satisfactory working condition than we have at present.

Chairman Woodbridge: We will now pass on to the next subject, which is porcelain line insulators.

One of our guests at this meeting is Mr. P. M. Lincoln of the Westinghouse Company, who is known to you all, if not personally, by reputation. One of the objects of his visit

to the coast is to investigate the insulator situation. It may not be known to all of you that the Westinghouse Company has decided to go into the insulator field. I should like to ask Mr. Lincoln for his views on the insulator question, particularly on the question of improvements in insulators which may avoid deterioration and other difficulties.

P. M. Lincoln: Concerning this matter of insulators, it is one in which I have been interested for many years. I remember many years ago when I had the duty of conducting Niagara power from Niagara Falls to Buffalo, that though that line was built in 1896 with only 10,000 volts, I am satisfied we had more difficulties with insulators than anyone would ever think of having on a 150,000 volt line today. We were obliged to take down the first insulators and we put 40,000 through tests, and my recollection is that we got two good ones out of the lot. But that is just an incident.

Now, this question of porcelain insulators is a very important one. One of your engineers on the Pacific Coast said to me last year that he considered the question of insulators on high tension lines to be the most important one before the electrical engineers today. That is a rather broad statement, but it comes pretty nearly being the truth. There was a time when we thought that porcelain when it was properly made would "stay put" forever. But things have come up within the last few years which cause us to doubt that. What is it that is going on in our porcelain insulator? I will confess that I don't know. And it is with a view of looking into that very question of what is the matter with our insulators and what we can do to improve them that the Westinghouse Company has decided to make some investigations. The question, we believe, is to a considerable extent a ceramic one—the question of the manufacture of the porcelain itself. For that reason we have decided to bring out a man who is familiar with the manufacture of porcelain and let him study the question on the ground. You gentlemen out here on the Pacific Coast probably have had more experience in the matter of high tension transmissions than any other section of the country, and we believe, therefore, that this is the place to study the question. We expect to have a man out here who will spend several months in the field seeing if we cannot solve the problem. He will study, so far as he can, in conjunction with those who are already studying this question here, and will study it with peculiar knowledge of his own, in that he is familiar with the ceramic side of the question. We hope that the studies of this man will bring something out. If he does not bring out something it will not be for lack of effort on our part.

Field Testing of Insulators

Chairman Woodbridge: Professor Sorenson of Throop College of Technology has developed a method of field testing for defective insulators apparently superior to the methods previously used, which method has been extensively used on the system of the Pacific Light & Power Corporation. I should like to ask Professor R. W. Sorenson to tell us about the organization of that work, and, if the members want it, about the details of the apparatus.

Prof. R. W. Sorenson: The porcelain insulator problem



The Field Testing Outfit in Transit

consists of two parts, (a) getting good insulators; (b) eliminating poor ones from the lines before they cause trouble. I will dismiss the first by the statement that there is no satisfactory porcelain insulator of the suspension type, as evidenced by the fact that insulators which have been in service on lines for $2\frac{1}{2}$ to 3 years show in some cases as high as 30 per cent loss in that time, the average loss on the lines so far tested being about 18.5 per cent for the three years.

With this loss there must be some method of eliminating bad units before they cause trouble. On the particular lines which have been completely overhauled we found the oscillator test to be the most satisfactory, it being more certain than the megger, and more convenient than the high potential test at normal frequency. Also the oscillator test has the advantage of being safe to handle because no harm is done an operator who may receive a shock from it, which, of course, is not true of the normal frequency high voltage used for that test.

The value of the elimination of bad insulators from lines is shown by the fact that the three lines overhauled on which there is a total of about 30,000 units, have not been subject to a single shut down during the wet season just passed, a record not previously attained.

The oscillators used for this work were constructed in the shops of the Pacific Light & Power Corporation upon my recommendation. They have been satisfactory both for use on the ground and on the tower lines as illustrated by the accompanying photographs.

While the high frequency method of test has been so satisfactory in this case, it is not on the basis of present knowledge advisable to say that it is the one method of test for all conditions for it may be that some conditions will be encountered when other methods of test will be more suitable.

In fact as in every important undertaking it has been the group of men or the organization doing the work and not the apparatus that is responsible for the success of the campaign to eliminate the bad units on the lines giving trouble.

The method of procedure of the men doing the work was as follows: A test station was established at San Bernardino and tests were made on a large number of suspension insulators taken down from a line 26 miles long which had been operating at 15,000 volts with 3 units per suspension and 4 units per dead end.

The first group of these insulators was given 4 tests, megger, high frequency, induction coil, and high potential at 50 cycles.

The results of tests on this group of about 1000 units showed the induction coil and the high frequency oscillator tests to be twice as effective in eliminating bad units as was the megger, that is about double the number of units were found defective by the induction coil or oscillator as were found by the megger. The results of comparison between induction coil and oscillator showed no advantage for either as to effectiveness of test.

A few more units, about 1 per cent additional was eliminated after a few seconds' application of the 50 cycle high potential test just under arc over voltage. This was taken as an indication that we were not over testing with the other

methods, and also furnished the basis for concluding that low frequency high potential tests were not necessary. Further tests bore out this conclusion.

All these lines are wood pole lines with ground strips on the cross arms connected to the insulator supports.

At the present time tests are being conducted on the 150,000 volt line of the Pacific Light & Power Corporation, running from Big Creek to the Eagle Rock substation near Los Angeles. This is a steel tower line with 9 units in series in suspensions and 11 units in the dead end strings. The investigation on this line up to the present time shows a much lower loss than encountered on the other lines, the megger eliminating a little less than 2 per cent as defective and the oscillator picking out about 3.5 per cent as defective, with one spot showing as many as 14 per cent of defects.

As to the oscillator, its cost is low, the resonator part weighs about 60 lbs. and can be pulled to the top of a tower so that all the energy is not radiated from leads running to the insulator as would be the case with the oscillator on the ground.

Later on much difficulty was experienced in attempting to use the megger because of moisture which collected on the

The three lines tested traverse a total distance of about

The three lines tested traversed a total distance of about 92 miles and have approximately 27,000 suspension units in service on them.

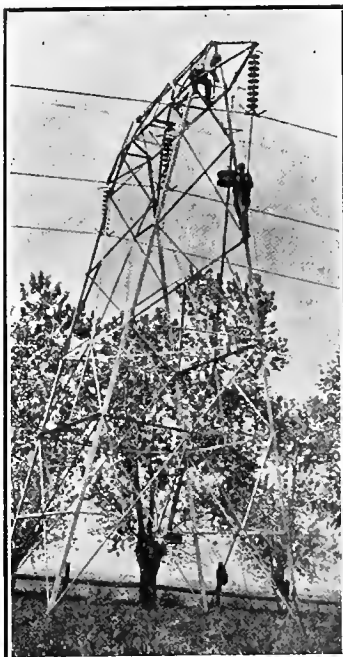
The lines had at the time of these tests been in service about three years and previous to the making of the tests had been meggered each year. This meggering process had eliminated about 8 per cent of the units as bad. The more vigorous tests of this year took out 10.5 per cent additional on one part of the line and 13 per cent additional on another part, making the total loss of insulators during the three years of operation about 19 per cent of the number on the lines.

The defective units were not evenly distributed over the lines, some districts showing as few as $2\frac{1}{2}$ to 3 per cent defective and other districts showing places with over 40 per cent defective.

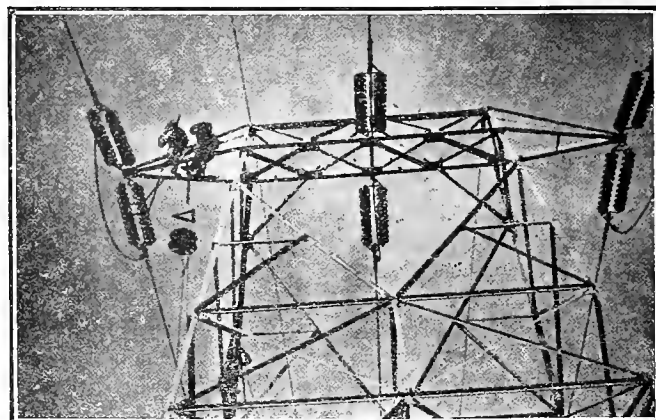
The entire equipment aside from the power plant probably weighs about 250 lbs. and hence is not extremely hard to transport.

Chairman Woodbridge: Mr. Woodbury has charge of that 150,000 volt line, that being the highest voltage in the world, I would like to hear from him on the deterioration of porcelain.

E. Woodbury: We have had one failure, but it is hardly chargeable to the porcelain. We had a large forest fire which damaged the insulators. There were 132 insulators on the tower, and immediately after the fire we took out about 50. After that there were some rains and it seemed that practically all the insulators on the tower were cracked internally. After this damp weather the balance of the insulators became defective. When the string of insulators broke down it seemed probable that all the insulators in the string



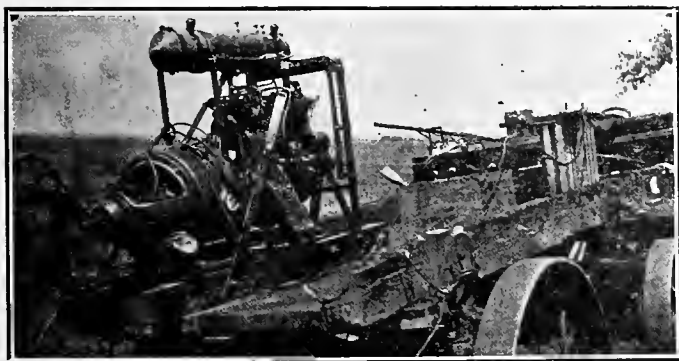
Testing Insulators



Attachment on Steel Tower for Testing Insulators

were defective. Outside of that there has been no case of insulator failure on the line. We megger the insulators every year and take out a per cent or two. At the present rate and from experience in the last four years it would seem possible to remove the defective insulators every year with the megger and get along without trouble.

Professor R. W. Sorensen: We took our clew from the high frequency coils made for medical men, and modified it to suit our conditions by building it in a small tub or keeler and immersing it in oil. This oscillator is a little fiber tub 20 inches in diameter. In it we have a coil of 3000 turns on one side and 32 turns on the other side, the 32 turn side being the primary. We bring a lead out to the top. We ground the primary side, that is, connect it to the secondary side. It is really in the form of an auto transformer, and we bring a lead to the top and put two spark gaps just far enough to arc over at a voltage just slightly over that which goes over the insulator, because this machine generates so much voltage that if we open the gap it will destroy itself immediately. Then we put a condenser in series with this machine and across the secondary of the transformer that steps up from 110 to 3500 volts. Also across the transformer we put a spark gap made of two pieces of silver. The arc surging across the gap produces our high frequency current which is somewhere from 200,000 to 250,000 cycles per sec-



Movable Power Plant for Testing Insulators

ond. We supply the energy for that on the road by a little power plant that we constructed by changing a 3 h.p. d.c. motor to a single phase alternator, driven by a motor cycle engine or from the engine of a Ford. When we want to test we have everything on the ground except the oscillator. Trailing back from the wagon you will see our ground wire which is a long piece of bare copper cable. The oscillator is drawn up the tower and some transformer cable carries current at 3800 volts from the transformer and other apparatus, up to the oscillator. The man having the outfit on the ground has a telegraph key to use for a switch. Two men press their sticks up against the insulator to be tested and numerous arcs are caused to travel over the insulator being tested.

Inductive Interference

Chairman Woodbridge: We will have a further opportunity for discussion of this matter when we see the oscillator and that will probably be a better time.

The next subject for discussion is Inductive Interference. The joint committee on Inductive Interference has contributed to the report of the engineering committee all that it is at liberty to say before it makes its final report to the railroad commission. I should like, however, to ask Mr. H. S. Warren, who has been representing the telephone interests, for his views on the situation. Mr. Warren comes to us from Mr. Carty's office in New York, and is particularly qualified to speak on this subject.

H. S. Warren: I am very glad to be here and to say a few words to you. The telephone companies are, of course, vitally interested in the matter of inductive interference as their service is directly affected. The subject is a very difficult one from a technical standpoint. About four years ago

I had the pleasure of visiting this section of California and interviewing some of the representatives of the power companies, making the suggestion that an investigation be made of inductive interference and asking whether the power companies would be interested to co-operate in an investigation of that sort. The suggestion was accepted, every one that I saw agreeing that it was a subject which ought to be studied. A tentative plan which was relatively crude in form was looked over and favorably received. None of us had any idea at that time that the investigation would develop into what it has since become, having extended over four years of very hard and very excellent work. I don't know whether you gentlemen realize that this subject has been studied more thoroughly and the art has been advanced to a greater degree by this work in California in the last four years than has been the case in any other part of the world. There is no comparison, so far as I know, in the extent of work done and results reached. Still we have by no means exhausted the subject, it is so tremendously complicated and involved. I did not come here prepared to make a speech and I don't wish to go into the details of the subject. I think it is understood by all of you that the committee is now working on a final report which will include some revision of the existing rules. They will be improved as much as possible, and we hope in a comparatively short time that report will be available.

As to the special attitude of the telephone company on the subject, I will say that as far as I am personally concerned it is my ambition that this report shall be as nearly right as possible when we get it done. It is necessary in some cases to make what might be termed an arbitrary decision as to certain limits. The facts are so involved, the relations between them so uncertain, and sometimes necessary data is not available, that we have to estimate from all we can find out where the limits should be placed. It is my desire that these limits shall be placed at the proper points. We do not wish to make rules which are unduly burdensome. We are trying to get a treatment of this subject such that whoever at some future time does the work of revising the rules and looks back on the work of the present committee can say that it did a remarkably good job in its day and generation.

Chairman Woodbridge: Mr. Bridge has followed the work more closely than any other of the commission's engineers, and I would like to have the views of Mr. Bridge from the commission's point of view.

A. F. Bridge: The experience which the commission, the power and communication utilities have had in the application of general order No. 39, which as you probably know is the inductive interference order of the commission, based on the preliminary report of the joint committee, has indicated certain deficiencies and defects which as a result of its further work the committee hopes to remedy at this time. In fact, the first report was of such a preliminary nature, and the limitations recommended so general, that considerable criticism has been directed against the order on those grounds. I think, however, if it is borne in mind that it was necessarily a preliminary and tentative order, and if everybody could appreciate as I do the spirit of co-operation which has been engendered in the two opposing interests—communication and power companies—and consideration for the other man's difficulties, it would be realized that certainly no small work has been accomplished so far.

One of the chief objections to the original order was that no definition or limiting conditions were given which would indicate under what conditions a parallel was liable to be created. The committee has been doing considerable work in an effort to give information which will enable an engineer contemplating the construction of a power line in proximity to a communication line, to predict whether or not it will become involved in a parallel. There are so many factors affecting this matter, particularly with respect to paral-

rels with telephone lines, that the results can be only approximate. However, we hope to furnish a guide for the predetermination of conditions which may cause inductive interference, and by adopting limitations based on the effect in reducing efficiency of telephone transmission or speed of telegraphic equipment to obtain a basis which will require, if these limitations are liable to be exceeded, the employment of certain mitigative measures in the construction of the line which will be far less expensive than if installed subsequently.

Another point which it seems necessary to cover is the question of prorating the cost of mitigation of interference or of avoidance of parallelism. This problem involves not only engineering and accounting but also the equitable responsibilities of each party.

While we feel that possibly we are not wholly qualified to cover all of these features, we have, nevertheless, evolved a rule for consideration of the lawyers and financial managers.

In the first order the question of parallels with grounded telephone systems was not covered, and we have found that it is desirable to do so since many such develop and must be cleared up. I think that is about the extent of what the committee hopes to accomplish. We expect to have this report completed in the immediate future, and I assume that will form a basis for a revised general order by the commission.

Standardization of Hardware

Chairman Woodbridge: I would like to have Professor Scrugham outline his request and his views on it, but he does not seem to be here at the present time.

The next subject on our program is the Standardization of the Hardware for Clevis Cap Suspension Insulators. A paper on this subject has been prepared by Mr. L. M. Klauber of San Diego. We will read the paper by title only and ask for comments and discussion.

Jos. S. Thompson: I would like to say that naturally all the manufacturers have standards of their own, not necessarily meshing in with the standards of other manufacturers. But even those standards have been disarranged recently by the fact that it has been very difficult for them to secure hardware to keep up with their demands, and every foundry has its peculiarities. Frequently insulators apparently complying with their outline drawings and standards, may have pinholes of the sizes that are prescribed, but the coring of the castings or the handling will make a difference in the clearances or location of the hole, and the eye and clevis will be crowded together. So it is at present difficult enough for the manufacturers to adhere to their own standards. It is to be hoped that they will all come to adhere to one that is fixed and to govern them all.

C. P. Leibold: I can only substantiate what Mr. Thompson has said. It is indeed one of the real troubles of the manufacturers nowadays, to get castings which look like his drawings.

We have to go to strange foundries. We are handling more material than we ever handled before, and it is four times as difficult to get the quantity as it was formerly. It is almost impossible to describe the troubles.

I have read Mr. Klauber's paper with a great deal of interest, and there is no question in my mind but that there is a certain field in which there is something to be done, especially for insulators for work on distribution lines. It might be that when made as Mr. Klauber describes, it might make them less efficient on suspension work, because it causes greater spacing between insulators and brings in a greater quantity of metal in the cap and in the stud casting. But that is something for investigation and that is something which does not enter nearly as much into the design of insulators for corner work on distribution lines. I know that the Ohio Brass Company and undoubtedly the other firms engaged in the manufacture of suspension insulators, will be

glad indeed to seriously consider the standardization which your paper suggests.

A. Bowie: Insulators are often made with a change of diameter of the head of the top shell. This requires readjustment of castings to fit them, and has sometimes caused a good deal of inconvenience and trouble in the manufacture of switches. For instance, a quarter of an inch will make a difference between a cap fitting or not fitting on the insulator.

L. M. Klauber: Gentlemen, I want to make clear the present status of this proposition. At the time the engineering committee decided to investigate the matter of the standardization of the hardware of the clevis cap insulators, we had no knowledge that any action had been taken along these lines by the manufacturers or any operating company, but after corresponding with three of the manufacturers we learned, that just prior to the appointing of our own committee, representatives of the manufacturers had met in New York with representatives of the Electric Bond & Share Company for the consideration of the matter which we have before us. At this meeting, at which but one operating company was represented, they decided on a form of cap which is quite different from that which the majority of Coast companies have been using. The manufacturers have stated that while the clevis cap as adopted is in the future to be known as the Manufacturers' Standard, they are quite willing to give us modified designs as ordered, but we should now agree on a practical standard which will ultimately reduce the cost of insulators to all, by limiting the designs to at least two and if possible a single type. Unfortunately, the standard agreed upon at this meeting in New York is so largely at variance with what we have been using, being based on a $\frac{1}{2}$ in. instead of a $\frac{5}{8}$ in. bolt, that it is doubtful whether our Pacific Coast companies will ever adopt the new standard. Therefore, as this standard has not yet been discussed at engineering meetings, nor generally adopted by operating companies, it is not yet an official standard in any sense of the word, and if we desire to see it modified, now is the time to voice our opinions. In future it will become far more difficult to effect a change; so if any of you gentlemen, based on your experience, prefer the $\frac{5}{8}$ in. bolt design given as a suggested standard in the report of this committee, which suggested standard closely approximates what he have used in the past, your protest should be made now.

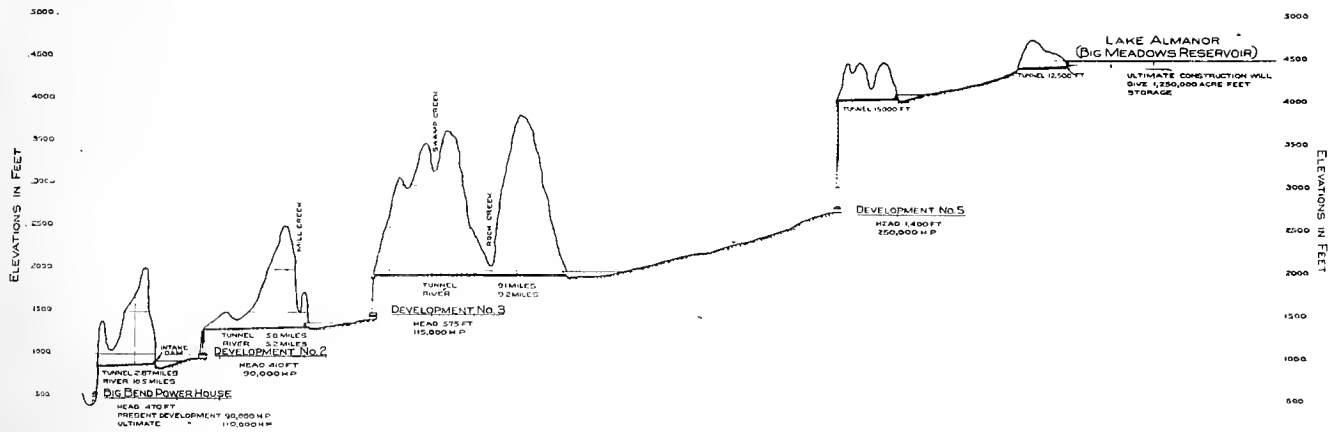
The manufacturers have given as the principal objection to the adoption of the $\frac{5}{8}$ in. standard, the increase in the length of the string and the weight of the metal, but as a matter of fact any of these manufacturers will give us an insulator having a $\frac{5}{8}$ in. bolt at the same price as the $\frac{1}{2}$ in., and the increase in length will be found of minor importance.

Therefore this matter is brought before you for discussion in the hope that our operating engineers will express their opinions as to the relative merits of the so-called manufacturers' standard and the suggested standard.

J. P. Jollyman: If a standard is to be of any real use it should be a universal standard. The difference between the two standards, perhaps, is hardly sufficient to warrant the other people in holding out for their standard. I therefore move that the engineering committee take up with the proper committee of the national body of the N. E. L. A. the question of obtaining a universal standard which will meet all of our requirements and which will be carefully considered before being adopted.

(The said motion is seconded.)

C. O. Poole: Personally I can see that the $\frac{5}{8}$ in. standard pin would serve all the purposes that the $\frac{1}{2}$ inch pin would serve, and would certainly fit in with a great many insulators now in service. What little additional cost might be involved I don't think cuts much figure, and I am strongly in favor of adopting the $\frac{5}{8}$ in. pin as standard. Another point is in connection with the metal on the lugs of the clevis. Three-eighths of an inch is the standard we have been using and I think that is a very good plan. While the $\frac{5}{16}$ in. might



Profile of Present and Proposed Developments on the North Fork of the Feather River, showing Location of High Head Turbines

be safe, yet I think the additional thickness of metal might insure better results.

S. J. Lisberger: I desire to call attention to one point. If this matter is to be referred to a committee of the National body, it should be borne in mind that the committee for 1917 has completed their work. The new committees do not commence work much before September. Would it not be well to bring your objections to the attention of the manufacturers, in order that they do not go too far on this work of standardization, asking that they await the result of the meeting of the National body before the apparatus is actually changed. In other words, the new committee, to which this is referred, very probably cannot arrive at a decision before next December and the manufacturers may have started these new standards before your report is brought to their attention.

(Thereupon motion as made and seconded is put and carried.)

High Head Francis Turbines

Chairman Woodbridge: The next subject for this morning's program is that brought out by Mr. Jollyman's paper on High Head Francis Turbines.

J. A. Koontz: There is just one point I wanted to bring out. In regard to high head turbine runners. The people on this coast feel that the Francis turbine runner must be subjected to rather serious wear, and that it is not to be classed with the Pelton runner. I wish to state since starting our plant on the Feather River in 1908, and at that time high head turbines were more or less in the experimental stage, we have operated with exceptional success under a 420 foot

brass runners that there is practically no difference in the material used, the wear depending totally on the design. If your blades are properly shaped and the runner properly designed the wear is exceedingly small. About the only trouble we have had from wear is from clearance, and in the later units, this has been taken care of by putting on clearance bands which are removable. At the time of removing we have developed a special boring machine and the scroll-case is trued up and a new band put on the runner and the machine is brought back to approximately the efficiency it had when new. These runners have been in operation since 1908 and are still giving good service. We do not recommend cast iron runners, as we had a blade broken in one turbine by a large rock getting into the pipe line. At the present time we are standardizing on the cast steel runner, but only because we obtain it more cheaply. Sometimes the wheels operate practically two years without any attention and are never opened up in that length of time.

R. J. C. Wood: Might I ask the size?

J. A. Koontz: 18500 horsepower wheel, operating under 420 ft. effective head, at 400 r.p.m.

C. O. Poole: I wish to say we installed in 1907 a Francis turbine wheel in one of our plants, under a 400 ft. effective head. At the end of 6 months operating the efficiency dropped to about 60 per cent. We shut the unit down and put in new throat pieces and ran for another six months and it dropped to 40 per cent and we had to discontinue the use and put in a tangential wheel. The reason was due to the fact that we had cloudbursts during certain portions of the year which carried down a great deal of gravel which was responsible for the failure. We came to the conclusion that for our particular purposes we could not make use of the turbine wheel. I want to say also that we are operating under about a 60-foot head in our Imperial Valley district, some small turbines of about eight or nine hundred horsepower, using Colorado River water. The runners will last about two years, when they have to be entirely renewed, owing to the drop in efficiency from the scouring effect.

Chairman Woodbridge: What are the runners made of?

C. O. Poole: Bronze and steel. Bronze stands better, but at the present price of bronze we are not using very many bronze runners.

Chairman Woodbridge: Mr. Lighthipe, have you any turbine wheels on your system?

J. A. Lighthipe: We have none on our system, but we are figuring on two of the Francis type, for the new development on the Kern River.

Chairman Woodbridge: President Ballard tells me that the commercial section is not through with its program. So we will run parallel sessions this afternoon and will start at 1:30. We will take up then the subject of joint pole construction.

(Thereupon an adjournment was taken until half past one.)



Interior View of Las Plumas Power Plant on the Feather River

effective head. The wheels in question are 18,500 horsepower wheels. We have had runners of various materials in those wheels in operation almost continuously to the present time. We find that in the use of cast iron, bronze, cast steel or

RECENT ADVANCES IN WESTERN WATER LAW

BY A. E. CHANDLER

(Comments suggested by recent legislation and court opinions on Western water rights are vital to the needs of engineers throughout the West who are in any way interested in hydroelectric development of the great natural resources of this section of the country. It is with unusual pleasure that announcement is herewith made to readers of the Journal of Electricity that one of our best known authorities on Western water law, A. E. Chandler of the California Water Commission, is to contribute a series of Comments on recent advances in Western Water Law which will appear in the columns of each issue of the Journal for many months to come—The Editor.)

STATE AND NATIONAL FEES FOR WATER POWER PROJECTS

In accordance with a recommendation of the State Water Commission, the 1917 California legislature, by an act effective July 27, 1917, so amended section 23 of the water commission act that the fees in connection with new power development are materially lessened. Before amendment section 23 provided for an application fee of \$2.50 per theoretical horsepower up to 100 horsepower, of \$500 from 100 to 10,000 horsepower, and of \$1000 above 10,000 horsepower. It also provided for an annual charge, after the issue of license, of 25 cents for each theoretical horsepower. The section as amended provides for a filing fee of \$5 and, upon the issue of a permit the additional fee of 10 cents per theoretical horsepower up to 100 horsepower, of 5 cents per horsepower from 100 horsepower to 1000 horsepower, and of one cent per horsepower above 1000 horsepower. The annual charge has been eliminated. The application and permit fees are similar to those in force in Nevada and Oregon and exactly the same as those provided for in the "new water code" adopted by the 1917 legislature of the state of Washington.

The California water commission made the above recommendation regarding change in filing fees as applications for power purposes were discriminated against under the existing system. Applicants for purposes other than power had to pay a filing fee of \$10 only—regardless of the size of the proposed project. Irrigation, municipal and similar applications mean a proposed complete depletion (excepting "return waters") of available water supply by the amount to be delivered. Power applications on the contrary contemplate a return of the diverted water for further use below. Section 23 as amended places the filing fees for irrigation and power purposes on somewhat the same basis.

The annual charge has been eliminated under licenses for the diversion of water for any purpose as no sound argument could be found for its retention. It was probably originally based on the idea that the state owned the water and therefore should secure a return on its use. In approving a permit or issuing a license, however, the state gives no guarantee of the water right and the holder thereof must protect himself if litigation be initiated by riparian owners or prior appropriators. The supreme court of California in *Palmer v. Railroad Commission* (167 Cal. 163, 167) expressed itself as follows on this point:

"The theory that the water of a non-navigable stream in this state is in some sense 'public water' has been advanced before. It has been claimed that a diversion of water under the provisions of the Civil Code (secs. 1410 to 1422) constitutes

a grant of the water by the state to the appropriator. The idea may have arisen from the statement sometimes made in the decisions that the riparian owner has no right in the corpus of the water (*Eddy v. Simpson*, 3 Cal. 252, [58 Am. Dec. 408]) and that running water cannot be made the subject of private ownership, that the right to use the water of a stream 'carries no specific property in the water itself.' (*Kidd v. Laird*, 15 Cal. 179, [76 Am. Dec. 472]) This is far from saying that the property in the water is vested in the public, either for general use, or as property of the state. The doctrine that it is public water, or that it belongs to the state because it is not capable of private ownership, has no support in the statutes of the state, or in any decision of this court."

In a petition for rehearing the attention of the court was directed to the 1911 amendment of Section 1410 of the Civil Code, adding the words: "All water or the use of water within the state of California is the property of the people of the state of California." The court's interpretation follows:

"The amendment may possibly be effective as a dedication to general public use of any riparian rights which the state at the time it was enacted, may still have retained by virtue of its ownership of lands bordering on a stream, rights in the stream which it would in such cases have in common with owners of other abutting land. It could not affect the riparian rights of the other owners, nor the rights of any person or corporation claiming under them, nor rights previously acquired from riparian owners by prescription, nor rights acquired from the state prior to that time by appropriation under the code, in reliance upon the implied offer of the state to allow its riparian rights to be acquired in that manner, as indicated in the opinion."

No western state, other than California and Oregon, has attempted to levy an annual charge for the appropriation of water. The Oregon statute (1911) applies to all water power plants and not only to new ones as first provided in 1909. The attitude of the supreme court of the strictly arid states (where the doctrine of riparian rights to the use of water is not recognized) towards constitutional and statutory provisions declaring that the waters of streams, etc., are the property of the state or belong to the public, is well typified by the following from the Idaho case of *Walbridge v. Robinson* (125 Pacific 812, 814):

"We think it is clear that the title to the public waters of the state is vested in the state for the use and benefit of all the citizens of the state under such rules and regulations as may be prescribed from time to time by the law-making power of the state. This is not, however, an interest or title in the proprietary sense, but rather in the sovereign capacity as representative of all the people for the purpose of guaranteeing that the common rights of all shall be equally protected and that no one shall be denied his proper use and benefit of this common necessity."

The contention is often made that the waters of western streams belong to the nation and not to the

state, and it was particularly pressed in a recent case in the federal court wherein the constitutionality of the Nevada "water code" was attacked—Bergman v. Kearney, decided in March, 1917, and not yet published in the Federal Reporter. In disposing of the contention Judge Farrington said in part as follows:

"Any extended discussion of plaintiffs' second contention would be largely academic, and could lead to no profitable or decisive conclusion. * * *

"For years the national government has consistently recognized and respected rights acquired by appropriation to the use of water. It has conformed to the state statutes regulating the acquisition of unappropriated water; and when its proprietary interest in the use of running water has come in conflict with that of the individual, it has, like the individual, resorted to the courts for settlement and adjustment."

The fees fixed by the regulations of the Forest Service are however not based on the claim of federal ownership of the water but of the land. That the applications to the Forest Service are for right of way privileges and not water rights is emphasized in the following from *Utah Power & Light Co. v. United States* (37 Sup. Ct. Rep. 387, 392) decided by the United States Supreme Court March 19, 1917:

"Much is said in the briefs about several congressional enactments providing or recognizing that rights to the use of water in streams running through the public lands and forest reservations may be acquired in accordance with local laws, but these enactments do not require particular mention, for this is not a controversy over water rights, but over rights of way through lands of the United States, which is a different matter, and is so treated in the right of way acts before mentioned. See *Snyder v. Colorado Gold Dredging Company*, 104 C. C. A. 136, 181 Fed. 62, 69.

"As the defendants have been occupying and using reserved lands of the United States without its permission and contrary to its laws, we think it is entitled to have appropriate compensation therefor included in the decree. The compensation should be measured by the reasonable value of the occupancy and use, considering its extent and duration, and not by the scale of charges named in the regulations, as prayed in the bill."

In a pamphlet entitled "Water Power" (prepared in connection with the Ferris Bill) Secretary Lane said in part:

"The true value of power sites is, then, not the nominal figure of \$1.25 per acre, not their value as agricultural lands, timber lands, or coal lands, but their value as dam sites, reservoir site, or for other uses in connection with water-power development, and for this purpose the larger and more valuable sites are worth millions of dollars."

Secretary Lane specifically argued against the government asking a return on any such amount, but the above statement represents his view of values. The subject is decidedly a debatable one among both engineers and lawyers. The Interior Department, through its Reclamation Service, is probably the greatest single user of reservoirs. Its engineers in negotiating for its many reservoir sites strenuously objected to allowing anything in excess of a good market price for the tracts as agricultural land or timber land. To revert to the expression used in the above quotation from the *Utah Power Company* case, the experienced engineers of the Reclamation Service could not endorse the secretary's value of "millions of dollars" as a "reasonable value of the occupancy and use."

United States v. Colorado Power Co. (240 Federal 217) is a case wherein the power company refused to pay the annual charges fixed by the Department of the Interior and of Agriculture and its permit was revoked. Although the District Judge who wrote the opinion reflected somewhat on the character of the regulations, he held that the charges must be paid—as is shown by the following:

"And while the Act clearly does not contemplate full compensation for the privilege to be enjoyed, otherwise it would have said so, still it seems reasonable that the power should include the right to exact a sum needful for the proper protection of the complainant's interests. Congress did not manifest any intent to give the secretary the right and power to acquire for complainant an interest, directly or indirectly, in defendant's plant or business, nor to lay a tax on its product; and to put the defendant's business under public surveillance and thus subject it to examination as to the amount of electrical energy produced and disposed of, for the purpose of laying tribute thereon as a basis of a charge to be fixed by the secretary, is to carry the power granted to him to a doubtful length and further than, I think, is given by the Act. The charge made, and to which the defendant objected and refused to pay, was ascertained in that way. There is no present duty or purpose in these expressions to finally determine and adjudicate the limit of power in this regard, further than to say that the statute left a doubtful field of action for both sides, and the course taken by the defendant ought not to be construed as a risk of all it had. The average amount thus fixed was approximately \$100 per month. There is no proof that this is unreasonable and excessive and more than necessary in the protection of the complainant's rights; and the manner in which it was fixed is not of present concern, except that it operated as the chief cause for the resistance to the demand. It is enough now to say that I cannot find on the proof that the amount demanded was excessive or unreasonable."

The decisions clearly hold that the charges must be reasonable—and reasonable as based upon the value of the property occupied and not upon the value of the company's business. As the owner of lands the government has the undoubted right to charge for their use. The elimination of the charge must rest upon public policy and not upon law. Public policy, however, dictates consistency. If the government will exact from every industry using its lands in the future a charge commensurate with their value, the miner, the railroad man and the irrigator may object, but the policy thus inaugurated would at least be consistent. Water power development when but an infant was thought to wave a golden spoon, which now in the clearing light of experience is slowly being recognized as the workman's most indispensable tool. It is high time, therefore, for discrimination to cease.

MORE WATERPOWER UTILIZED IN SWEDEN

Owing to the scarcity of coal and coke, hydroelectric power plants are being extended and new ones constructed with all possible speed. The government hydroelectric power plant at Trollhattan is being enlarged by eight new machine units. The flow from Lake Vanern will be regulated at an expense of 13,000,000 crowns (\$3,484,000), and a new power plant near Trollhattan is to be built.

The government water power board has drawn up a preliminary contract for the delivery of 12,000 kilowatts of electric energy from the power station at Trollhattan to the Aktiebolaget Elektro-Saltpeteter.

SUGGESTIONS FOR CONTRACTOR AND DEALER

DEPARTMENT CONDUCTED BY GEORGE A SCHNEIDER

(Proper advertising and proper ideals of service are commercial factors that enter largely in the final balance sheet of success or failure with the contractor and dealer. In this column will be found excellent discussions on these two subjects. Protective devices for storage battery charging circuits also come in for their share of discussion at this time when information of this nature is most helpful. The author is power apparatus specialist for a large electrical supply house in the West with headquarters at San Francisco.—The Editor.)

SPIDERS VERSUS ADVERTISING

Mark Twain, who was a firm believer in good advertising, is said to have told the following incident at a famous dinner:

"When I was editing 'The Virginia City Enterprise,' writing copy one day and mining the next, I tried in many ways to drive home the fact that advertising pays. One day I received a letter from a subscriber saying that he had found a spider pressed between the pages of his paper. He wanted to know whether this signified good or bad luck. I replied, 'The finding of a spider in your copy of The Enterprise was neither good nor bad luck. The spider was merely looking over our pages to find out what merchant was not advertising in them, so that he could spin his web across his door and lead a free and undisturbed existence forever after.'"

Now, Mr. Dealer, suppose the big brother of this spider should follow out a similar scheme in trying to locate a permanent home. Would he find your ad in the columns of the local paper? Or suppose in his travels the spider stopped for a rest in your show window and while doing so looked it over and decided to stay. Would he be safe in spinning his web there and not be disturbed for weeks to come? More directly, the question is, "What are you doing to advertise your business—to create a demand for more electrical goods or your services—or to let the public know that you can supply the nationally advertised electrical goods and appliances?"

Just now the big men who are closely in touch with our country's needs are telling us to "keep business going." One way to do this is to advertise. The old axiom "It pays to advertise" is more applicable today than ever before and right now each of us in the electrical industry should give this simple truth charge by manufacturers and jobbers.

If you talk advertising to some dealers right away you will find them thinking of more expense. But advertising is not an expense if properly handled and should not be so considered. It is an investment—and fortunately for the dealer—a very small one if he will take advantage of the sales helps, such as lantern

slides, envelope stuffers, display racks, window displays and the like which are furnished to him free of more serious thought than ever before.

If you are not making use of these helps begin today. Get in touch with your jobber and see what he has to offer in this line. Select those helps you think best meet your needs. Then put them to work at once. You will be surprised with the results. Persistent, systematic, personal solicitation backed up with a neat, clean, well-arranged show window and the right amount of printer's ink makes for better business. Try it!

BUSINESS VEXATIONS AND SOME OTHER THINGS

You should not expect to sell to those who do not know you or your store. Advertising is the most effective way of telling possible customers what you have to sell.

It is the easiest thing in the world to sell goods—if you have the right goods—but you must know how to tell the people about them entertainingly.

A dealer who expects business to come to him without effort on his part lacks knowledge of human nature. If he wants business he must go out and get it.

Some men do things in a certain manner because their fathers did so before them and were successful. They cannot realize that the wonderful of today becomes the ridiculous of tomorrow.

To know a "good thing" is to be only half wise. To know it and use it to advantage is true wisdom—in business.

OPERATION OF

D. C. GENERATORS

Satisfactory results should not be expected from a direct current generator unless it is operated under practically normal conditions. Any deviation from these conditions may

seriously effect the temperature rise or the performance at the commutator. Normal conditions are fulfilled when a machine is operated at its rated speed, potential and current output and in a room in which the temperature is not abnormally high. Failure to observe these points is the direct cause of much trouble. This statement is especially applicable to generators used for battery charging in garages. In such service generators are likely to be operated under abnormal conditions because of the varying number of cells to be charged and the widely different charging rates.

The two essential points to be remembered are that there is a limit to both the maximum and minimum voltage at which a given generator can be successfully operated and that the rated current output should not be exceeded beyond the regular overload value under any condition. Analyzed further these limitations bring out the fact that we should not demand of a machine its rated energy expecting to obtain greater current output if operated at reduced potential or vice versa. Yet this is just what many garage men and others try to do. They understand that the product of the volts times the amperes in a direct current circuit equals the watts. Therefore they figure if one is reduced the other can be increased in

proportion just so the product of the two values does not exceed the watt capacity of the machine.

The most economical method of reducing the voltage is by regulating the field strength of the generator by means of a field rheostat. There is, however, a certain value below which the voltage cannot be lowered without producing excessive sparking. The range will depend entirely upon the design. In one line of motor generator sets the voltage can be varied from 60 to 120 per cent of normal. In another line of special battery charging generators the voltage can be reduced to about 20 per cent of normal by field control, but at the lower value the rated current output cannot be exceeded so the output is reduced as the voltage is reduced. When the minimum voltage is not low enough the difference must be taken up by an additional rheostat in series with the load.

Likewise there will be excessive sparking and heating if the voltage is raised above a certain value. Sometimes this is done by increasing the speed of the generator in an endeavor to charge a larger number of cells.

These points are nicely illustrated by a case of trouble that came to the writer's attention some time ago. A motor generator set had been made up outside the factory by connecting a 1000 r.p.m., 110 volt shunt motor to a 50 cycle three-phase motor with a load speed of about 1450 r.p.m. This set was intended for charging an electric vehicle requiring about 70 volts at full charge. When the voltage was reduced to this value by the field rheostat there was excessive sparking and the charging current fluctuated over a wide range. It was found advisable to order a new generator of the proper speed and voltage. The difficulty was caused by the very weak field which was not sufficient to give good commutation due to the cumulative effect of a greatly increased speed and reduced voltage.

Observation of these points will eliminate many troubles and incidentally much needless expense.

PROTECTIVE DEVICES FOR STORAGE BATTERY CHARGING CIRCUITS

In connection with storage battery charging equipments some form of protective device is necessary to prevent the discharge of the batteries when the charging circuit fails. The kind of device best suited for any particular installation will depend entirely upon the method of charging, the source of the charging current and whether the batteries are charged from a constant or varying voltage circuit.

Some batteries are charged from direct current constant voltage systems that are used also for light or power purposes. Others are charged from motor generator sets supplying a large number of battery circuits. These generators are usually operated at a fixed voltage and the charging current to the different circuits is regulated by a separate series rheostat in each battery circuit.

Again batteries are often charged from a motor generator set having a generator designed to work over a considerable range of voltage which enables the charging current to be regulated by the field rheostat

thus eliminating the wasteful series rheostat. Batteries for farm lighting plants are charged from constant voltage generators usually driven by gasoline engines. In this case there is likelihood of the engine stopping or slowing down which would allow the batteries to discharge if a suitable protective device were not provided. In such installations it is desirable to have a device that will automatically cut in the battery when the engine comes up to speed and thus restores the generator voltage to normal. Thus it will be seen there are a number of different conditions to be met even in connection with the simple circuits or equipments.

The simplest form of protective device for battery charging circuits is the plain underload type of circuit breaker illustrated in the accompanying figure. This breaker has a single operating coil which is placed in series with the battery. It is so designed that a cer-



New Protective Device for Charging Storage Batteries

tain amount of current must pass through the coil to hold the breaker closed. If the current falls below a certain value the breaker will open and remain so until manually closed. The breaker would therefore open in case the charging circuit should fail. However it would not prevent the battery from being charged in the wrong direction in case the polarity of the charging circuit should become reversed. This is a disadvantage for certain classes of work. By adding another series trip coil these breakers can be arranged for combined overload and underload operation. In ordering this type of breaker it is necessary to specify the ampere capacity required. Also to check the minimum current required to hold the breaker closed. This will range from about 6 to 20 per cent of the normal carrying capacity of the holding coil.

In a later issue another type of breaker and the automatic forms of cut-out switches for this service will be described.

Data on the effect of resin on the durability of woods have been worked up for over a hundred samples of longleaf pine. The results, when considered as averages for four durability classes, indicate that increasing amounts of resin tend to be directly correlated with increased durability. Individual blocks do not necessarily bear out this relation, showing that there are other factors involved.

FUEL OIL AND STEAM ENGINEERING

(A simple relationship of temperature and pressure for the boiling point of water is of high practical importance in steam engineering and fuel oil practice. Other mathematical relations such as total heat of steam, specific volume of superheated steam enter also into computations at certain times in preference to data that might otherwise be taken directly from the steam tables. These equations are discussed in the following article and the reader is shown how they may be applied and to what degree of accuracy they may be depended upon.—The Editor.)

RATIONAL AND EMPIRICAL FORMULAS FOR STEAM CONSTANTS IN FUEL OIL PRACTICE

BY ROBERT SIBLEY AND CHAS. H. DELANY

It has hitherto been pointed out that the relationships of temperature, latent heat and other steam properties are so complicated with varying pressures that no one as yet has been able to set forth simple mathematical equations for their representation.

There exist, however, a vast number of more or less complicated formulas that express with some degree of accuracy a relationship between these various factors. When such a relationship is deduced from some process of reasoning based upon known laws the equation is said to be rational. If, on the other hand, some one by sifting through the sands of time, as it were, has happened upon an equation with no rational backing the formula is said to be empirical.

Most of the equations used to set forth steam variables are partly rational and partly empirical.

Any equation, unless it be comparatively simple, is of little practical use to the steam engineer for he may pick the values desired from the modern steam tables with such facility that it is really burdensome to try and remember any formulas connecting these properties.

The Value of Formulas in Steam Engineering.—In certain theoretical reasoning, however, a formula setting forth these relationships becomes often of inestimable value and indeed at times leads one to attain data otherwise impossible to compute. Such is the case of the formula from which the specific volume of saturated steam is obtained by computation and set forth in the last chapter. Here it is found impossible to obtain by experiment that which is easily computed by application of this formula.

We shall next set forth some of the comparatively simpler relationships or equations that have been de-

vised or annunciated by various authors. These will serve to give the student an insight only into such complicated formulas that arise in attempting a mathematical expression for these data.

Unless one desires to go deep into the theoretical discussions of vapors and superheated gases such a brief introduction is nevertheless fully sufficient for the mastering of most problems in steam engineering computation.

Relation Between Temperature and Pressure of Saturated Steam.

—It has already been set forth that water boils or that saturated steam begins to be formed from water at different temperature of each variation in pressure. No one as yet has set forth a simple rational formula connecting this relationship. In the issue of Power of March 18, 1910, is to be found a formula which is the simplest and yet one of the most accurate empirical relations yet established. This formula connects the temperature in Fahrenheit degrees with the pressure in pounds per sq. in. at which water boils and is as follows:

$$t = 200p^{\frac{1}{4}} - 101 \dots (1)$$

For a pressure of 10 lb. per sq. in. the error is but 0.28 per cent while for 300 lb. per sq. in., it becomes but 0.32 per cent. The intermediate values are far less in error, so that this formula has, indeed, a wide range of usefulness.

The Total Heat of Saturated Steam.—Almost a century ago Regnault gave to the world his celebrated data on steam engineering. So accurately and so carefully did he perform his work that even today his experimental results are used in steam engineering computation, although of course corrections are applied where certain constants involved in computation are now known to have different values.

Regnault's Formula.—Regnault's formula for the total heat H_t of saturated steam at temperature t is one of the simplest ever invented and is as follows:

$$H_t = 1091.7 + 0.305 (t - 32) \dots (2)$$

THE CALL FOR MARINE ENGINEERS

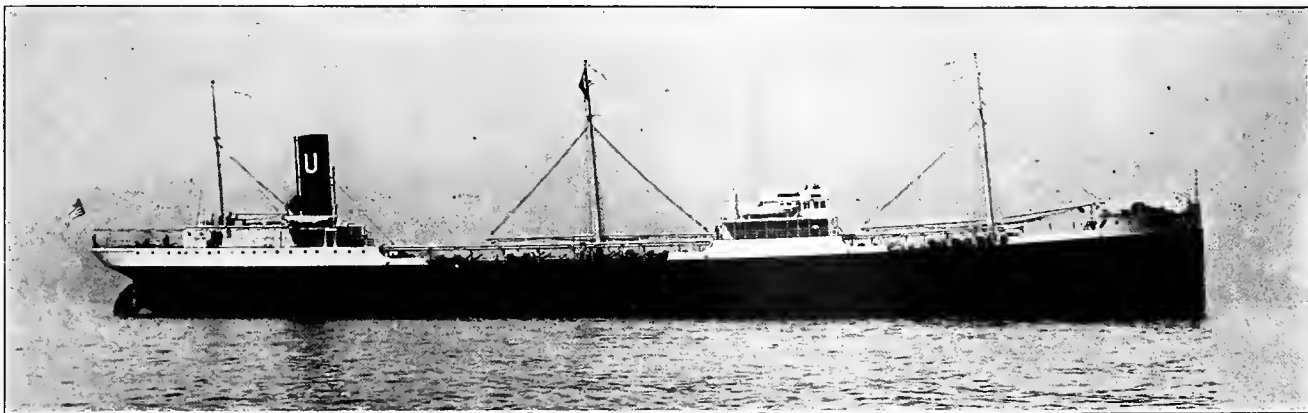
The Journal of Electricity has prepared to meet the newest and latest call upon the engineering talent of the West. Hereafter this department will not only serve to disseminate educative knowledge on fuel oil and steam engineering for central stations but its kindred applications on board ship will also be discussed.

The merchant marine will need within 18 months 5000 additional engineers in all grades. To start in training those not yet qualified to secure United States inspection papers, the government will open on July 2 a chain of free schools in marine engineering at some of the best known technical colleges in the country, for which marine engineers of all grades, oilers and water tenders, also stationary engineers are eligible; duration of term, one month.

After passing examinations of steamboat inspection service, students will have opportunity for further training under service conditions until wanted on ships at the new merchant marine.

The designated free engineering school for the West is Washington University, Seattle. Candidates for admission should apply to President Henry Suzzalo in charge of the course.

The data set forth in this department of the Journal should be found extremely useful for preparation in this latest call for national service.



S. S. LA BREA IN BALLAST TRIM

This is the first oil tank steamer equipped with reduction gear turbines. A product of a Western port, its features are representative of typical fuel oil and steam engineering practice that will be encountered in future service on the Pacific Coast.

Let us test this formula by comparing its results with those set forth in the steam tables for 235° F.

Regnault's Formula:

$$H_{235} = 1091.7 + 0.305 (235 - 32) = 1153.6 \text{ B.t.u.}$$

$$H_{235} = 1158.7 \text{ B.t.u.}$$

$$\therefore \text{Error} = \frac{1158.7 - 1153.6}{1158.7} \times 100 = 0.44\%$$

Hence we see that for low temperatures the error involved by using the classic equation of Regnault is less than one-half of one per cent.

Henning's Formula.—Marks and Davis have in the rear of their steam tables set forth a formula of Henning, which though somewhat more complicated than Regnault's is, however, very accurate. This formula may be expressed as follows:

$$H_t = 1150.3 + 0.3745 (t - 212) - 0.000550 (t - 212)^2 \dots\dots\dots (3)$$

Let us now test the accuracy of this formula by substituting the same temperature of 235° F. as used in Regnault's formula.

By Henning's formula:

$$H_{235} = 1150.3 + 0.3745 (235 - 212) - 0.000550 (235 - 212)^2 = 1158.64 \text{ B.t.u.}$$

From steam tables:

$$H_{235} = 1158.7.$$

$$\therefore \text{Error} = \frac{1158.7 - 1158.64}{1158.7} \times 100 = .0052\%$$

Hence the error involved in the use of this formula is seen to be extremely slight.

Latent Heat of Evaporation.—Thiesen, after observing certain limits toward which the latent heat of evaporation seemed to tend, suggested the following formula for the latent heat of evaporation of water:

$$L_t = 138.81 (689 - t)^{0.315} \dots\dots\dots (4)$$

Let us compare this with the steam table data for a temperature of 235° F.

Thiesen's formula:

$$L_{235} = 138.81 (689 - 235)^{0.315} = 953.7.$$

Steam tables:

$$L_{235} = 955.4$$

$$\therefore \text{Error} = \frac{955.4 - 953.7}{955.4} \times 100 = 0.178\%$$

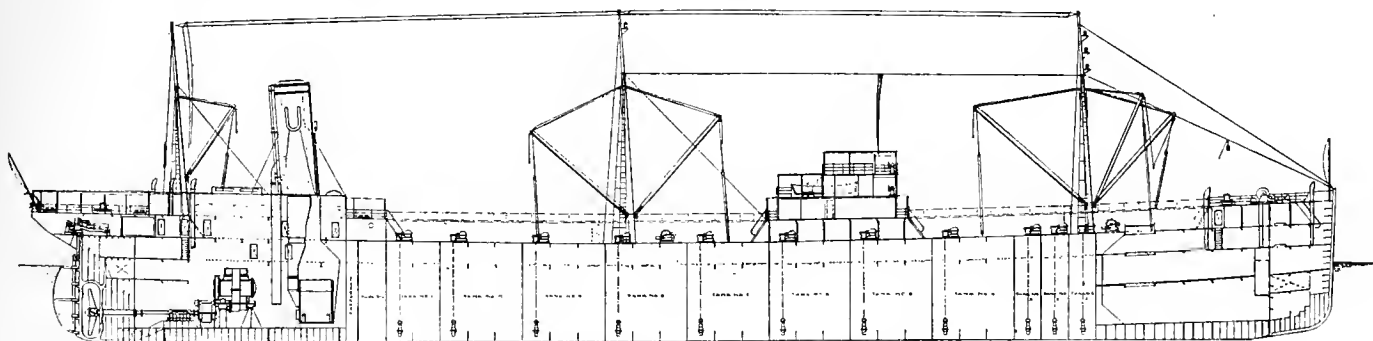
While the error here found is comparatively small, at higher temperatures this error becomes excessive. Hence we should apply this formula with due regard to its limitations.

A Second Formula for Heat Evaporation.—Students in the classes of mechanical engineering at the University of California have established a relationship for latent heat and temperature as follows:

$$L^2 = 1209423 - 1289.5 t \dots\dots\dots (5)$$

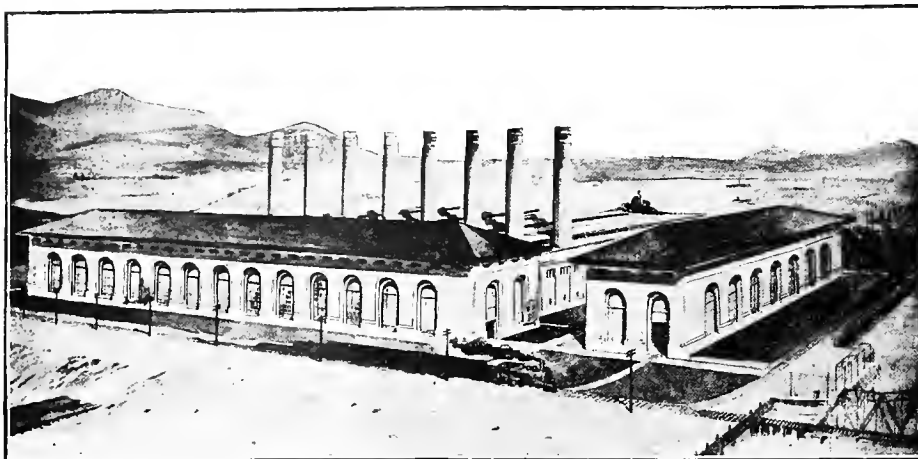
This formula is simple and yet accurate to within one-third of one per cent for a wide range of temperatures of from 100° F. to 350° F. and with three-fourths of one per cent for practically the entire range involved in steam engineering practice. The constants set forth were obtained by the method of Least Squares.

Relationship of Specific Volume for Superheated Steam.—In the chapter on Heat and Elementary Laws



THE PROFILE OF THE S. S. LA BREA

Herein is shown the general arrangement for cargo and for engine operation. Unique features of its equipment are the independent submerged cargo pumps, operated by electric motors on the deck.



THE LONG BEACH PLANT OF THE SOUTHERN CALIFORNIA EDISON COMPANY

In general the fundamental operating equipment of the modern central station plant, oil fired, is quite similar to the fuel oil and steam installation features aboard the modern high powered steamship. Consequently the thorough grounding in the one enables the engineer to quickly adjust himself to the new conditions met with in the other.

of Thermodynamics, it was shown that the pressure, volume, and absolute temperature of a perfect gas are connected by a very simple relationship as set forth in the composite formula given in equation (5). Indeed, it was shown that while superheated steam is not a perfect gas, still for approximate results this equation may be used.

For accurate work, however, the equation of Linde is found quite satisfactory although exceedingly cumbersome in its application. This equation connects the pressure p in pounds per sq. in. and specific volume v in cu. ft. per pound with the absolute temperature T in the following relationship:

$$pv = 0.5962 T - p (1 + 0.0014 p)$$

$$150300000 \left[\frac{1}{T^3} - 0.0833 \right] \dots \dots \dots (6)$$

To illustrate the application of this formula, let us endeavor to find the specific volume of superheated steam at 526.8° F. used in a turbine test when the steam was under a pressure of 187.2 lb. per sq. in. absolute.

It is seen that the absolute temperature of the superheated steam was

$$T = 526.8 + 459.6 = 986.4$$

and since the absolute pressure p was 187.2 lb. per sq. in., we have

$$v = 3.05$$

From steam tables:

$$v = 3.05$$

Hence in this instance the formula appears to be absolutely accurate for the range of units involved in the steam tables.

A Simplified but Limited Formula.—A convenient formula for a pressure of 175 lb. per sq. in., the approximate pressure involved in steam turbine operations, has been worked out by the mechanical engineering students at the University of California for superheat between fifty and six hundred degrees and is as follows:

$$v = 2.67 + .00377 t_s \dots \dots \dots (7)$$

Wherein t_s is the number of degrees superheat. The

accuracy of this formula is within one-half of one per cent for the range of superheat above set forth.

Other Relationships Exist.—

By making use of certain theoretic considerations in thermodynamics many other equations might be written setting forth still other relationships involved in the determination of steam constants, but sufficient illustrations have now been given the reader for a thorough introduction to such formulas. Perhaps after all the most important lesson one derives from their use is that their application is often so tedious and their range of accuracy often so questionable, that one had better stay on well trodden paths and master to their fullest extent the application of the steam tables and diagrams in the solution of all steam engineering problems.

(Continued from page 13)

come, if he uses judgment in securing the proper type for the particular occupation, and if he is careful to see that the goggles are fitted as nearly as possible to the size of face and nose of the workman. Some goggles are made with several different sizes of nose bridges, while in other makes the correct adjustment may be obtained by simple bending.

It is often necessary to first convert the foreman to the need of eye protection. The men should be asked to give the goggles a trial for a few days, after explaining the need for wearing them. They should be told that the eye is the most useful organ of the human body which is exposed and in direct contact with "all outdoors." It should be forcefully presented to them that of all five senses—hearing, feeling, tasting, smelling and seeing—the last is the most important, for with the loss of vision comes utter dependence on others for a livelihood. Bulletin boards should be provided and pictures posted, showing how eyes have been saved by using goggles, and how eyes have been lost, with all the entailing misery, where the eyes were not protected.

Individual goggles should be provided by the employer without cost to the wearer. When the employe has his own goggles, which are for his use alone, he need have no fear of contracting skin diseases which might follow the promiscuous use of goggles. He also becomes better accustomed to their use, and this aids in the process of education. Each pair of goggles should be provided with a case, which should contain in addition a "nonsweat" or paraffine pencil and a small clean cloth for wiping and cleaning. Where the lenses become fogged, they may be rubbed with the paraffine pencil, which will prevent condensation of moisture for a period of several hours.

Where the workman wears glasses to correct his vision, the goggles supplied should be large enough to permit wearing of the regular glasses.

SPARKS—Current Facts, Figures and Fancy

(Investigations in accountancy, electric water heating, electric vehicles, corporation efficiency and a host of other useful things, have been conducted by the National Electric Light Association during the past year. Briefs of many of the useful conclusions that have been drawn appear in the following notes. Other data of helpful turn may also be found below which perchance may offer a suggestion for further inspiration in your work.—The Editor.)

The United States Geological Survey estimates that the known supply of metals of the platinum group in the world is possibly five million ounces.

* * *

Pulverized fuel from lignite is being investigated as a possible fuel for locomotives in the West in order to economize and conserve the fuel oil supply.

* * *

The National Electric Light Association in its Rate Book for 1917 gives a tabulation of the rates in force in cities of 40,000 population and upwards. All general rates, field or published are included in the book.

* * *

The efficiency of recently designed steam-turbine-driven centrifugal pumps has risen steadily with the experience of the builders and with improvements in auxiliary equipment, until duties under standard steam conditions exceeding 150,000,000 ft. lb. per 1000 lb. of steam are now obtained.

* * *

Temperature tests on seventy-two different species of wood-destroying fungi have been made at 24 deg. and 40 deg. C. The lower temperature has proved to be the best temperature for twenty-two species, while at the higher temperature fifty-four of the forms have shown no growth in three weeks.

* * *

The smelter production of primary copper in the United States during the past year was almost two billion pounds, netting an increase of nearly forty per cent over the previous year. Surely the electrification of railways will not be wanting for copper when the proper time arrives for its installation.

* * *

The recent publication entitled "California, its Resources and Possibilities," by the California Development Board, at San Francisco is a splendid compendium of useful information to all interested in securing helpful items for putting the best foot forward in presenting possibilities of the west.

* * *

Future development of power in America is being urged in such a manner as to stop indiscriminate building of small power houses and to develop a complete and continuous network of wires all over the country, not necessarily all owned and operated by one company, but probably the better arrangement would be to have individual distributing companies in each community.

According to the report of the electric range committee of the National Electric Light Association from investigation it appears that electric cooking has been practiced economically and successfully for many years where rates and conditions have been favorable. It is increasing by leaps and bounds, gaining in popularity much faster than is generally realized, and the future holds infinite possibilities.

* * *

The accountant section of the National Electric Light Association has recommended that the association employ a high-grade man, well versed in central station accounting, whose mission is to be—upon request—to visit the small central stations, and in co-operation with their accounting departments, assist in initiating standardized systems suited to their requirements, and otherwise render help of a practical and valuable nature.

* * *

A standardized system of accounting has been recommended to the member companies of the National Electric Light Association, thereby making a form readily available for comparison and for efficiency study. One result is predicted to immediately follow, namely, that when the costs of electric vehicles are intelligently contrasted with those of gasoline and horse-drawn conveyances, the merits of the electric vehicle will be quickly apparent.

* * *

The National Park in Alaska which Congress created last spring is one of the monster spectacles of the world. To say that Mt. McKinley rises 20,300 ft. above sea level and that it is the loftiest peak in America is to convey no idea whatever of its grandeur. North of the vast mountain is a rolling country dotted with beautiful lakes and forests and inhabited by enormous herds of caribou, with untold possibilities of future water power development.

* * *

With favorable weather from now on the total winter wheat yield may somewhat, though not materially, exceed the harvest of last year. At this stage of the growth of the spring wheat crop all that can be reasonably said is that the law of chance is for a greater production than last season. If, however, we should not have as much wheat to export as would be necessary, there seems a strong probability that we shall have other available food supplies, such as corn, oats, potatoes, and the like—not only in full measure but running over. Such are the assurances given by the Committee on Statistics and Standards of the Chamber of Commerce of the United States.

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CONTENTS

War Policy for Utilities. By A. W. Leonard.....	1
Central Station Practice in Central America. By J. W. Finch.....	2
Commercial and Engineering Expansion Abroad. By John Clausen.....	5
Use Water Power and Save Fuel.....	5
Banking Institutions "Doing-it-Electrically." By F. D. Weber.....	6
The Forest Covering and Its Relationship with Stream Flow.....	7
Hyperbolic Analysis for Engineering Problems. By W. D. Peaslee.....	8
Metal Flume and Its Value From an Economical Standpoint.....	10
Gems of Salesmanship. By Charles M. Schwab.....	11
A Demand Factor Curve.....	11
Eye Injuries and Their Prevention. By John R. Brownell.....	12
Possibilities of Industrial Electric Heating. By S. F. Walton, A. E. Holloway, W. S. Leffler, G. B. McLean, H. S. Batchelder, Samuel Kahn, Edward Whaley, W. M. McKnight, C. F. Butte, John Crawford, Jr., and C. T. Carr.....	14
Electrical Problems Peculiar to the West. By R. H. Ballard, J. E. Woodbridge, S. J. Lisberger, L. R. Brown, W. P. L'Hommedieu, C. O. Poole, E. R. Northmore, P. M. Geibel, A. H. Babcock, P. M. Lincoln, R. W. Sorenson, H. A. Barre, J. H. W. Warren, A. F. Bridge, Jos. S. Thompson, C. P. Leibold, A. Bowie, L. M. Klauber, J. P. Jollyman, J. A. Koontz, R. J. C. Wood, and J. A. Lighthipe.....	19
State and National Fees for Water Power Projects. By A. E. Chandler.....	28
Suggestions for Contractor and Dealer. By George A. Schneider.....	30
Formulas for Steam Constants in Fuel Oil Practice. By Robert Sibley and Chas. H. Delany.....	32
Editorials.....	36
Personals.....	39
New Bulletins.....	40
Book Reviews.....	40
Builders of the West—VIII. M. M. O'Shaughnessy.....	41
Meeting Notices for Electrical Men.....	41
What Western Inventors Are Doing.....	44
New Electrical Developments.....	45

THE RED CROSS

When amidst the roar of cannon, the din of musketry and the carnage of battle the American soldier sinks to the dust, raising himself to take one long, last look of life, he hears in memory's faint echo that plaintive strain, "Home, Sweet Home," may that faint echo convey with it the inward realization that the nation as a family have joined with him in giving of the same love, of the same human affection and of the same sacrifice of all. Such are the sublime aspirations and ideals of that one great piece of human machinery—the American Red Cross.

One of our Eastern contemporaries in writing editorially on the agricultural needs of the Far West states that there is no dearth of oil in California. It is rather surprising that a statement such as this should be made by one so high in authority, when the official reports of the state mineralogist and a recent address of Van H. Manning, director of the U. S. Bureau of Mines are generally available, which show conclusively the rather precarious state in which fuel oil now finds itself. Those of us immediately on the ground, however, realize full well the seriousness of the situation and that it is not competition with gasoline and oil engines that is to be feared, but rather is it to be hoped that enlarged and nurtured development of the gigantic water powers of the West may at the earliest date possible be properly made under more encouraging conditions from governmental authorities.

The recent effective consolidation of the two great hydroelectric organizations of Southern California, combined with efforts that are being made to conserve the fuel oil and safeguard the service of central station activities throughout the West, lead thoughtful men to ponder the question "Why not state-wide consolidation of all utility effort of this nature?"

Surely the policy of the regulatory bodies is not against such action, for long since decisions have been put on record, time and again, in which it is made clear that regulated monopoly is most desirable.

The irresistible array of arguments in favor of consolidation of hydroelectric utility effort throughout the West is slowly but surely growing upon the public mind and from it will undoubtedly result the grandest and most effective interlinking of co-operative effort ever realized in the history of the electrical industry.

Conserve the Fuel and Safeguard the Service

Attention was called in an editorial of the Journal of Electricity, June 1, 1917, to the necessity of interconnecting transmission lines throughout the West and thus conserve the fuel and safeguard continuity of service. It is gratifying to note that splendid co-operative effort is seen in California and other localities of the West looking toward the fruition of this ideal. The matter has received the serious attention of power plant managers, state councils for defense, the executive officers of the Pacific Coast Section of the N. E. L. A. and the California Railroad Commission. In California it is suggested that a bus line from Redding to Fresno, a distance of about 300 miles be established. This would directly connect the large Pit River development now under way with the group of systems in Central California, and would have sufficient capacity to transfer considerable blocks of energy to or from the Pacific Light & Power Company's Big Creek plant and thus to the Southern California group of companies.

A tie-in at the junction of the Pacific Gas & Electric Company with the Great Western Power Company midway between Marysville and Sacramento and the construction of 25 miles of line between the Sierra & San Francisco Power Company station at Manteca and the Great Western Company station at Isleton would also be an important accomplishment.

This is only one of many constructive moves that might be made in various localities of the West and certainly it is to be hoped that the good work now started will at the earliest possible moment be brought to a concrete reality.

The Puget Sound Traction, Light & Power Company has formulated a policy to be followed during the period of the war. A number of meetings of heads of departments have been held to study the situation which have considered and discussed necessary readjustments of the working force, with a view to making the entire organization helpful to the government, and at the same time keep it as responsive as possible to any demands that may be made for community service.

Preliminary to this work of readjustment a military census of the employees was taken which has placed a fund of information in the company's possession. For instance one line on the census cards notes the former occupations of all the workers. Men who were auto tire makers, bricklayers, ship carpenters, sailors, plumbers, steam fitters or joiners are now trainmen, linemen, collectors, solicitors or clerks. The possession of this information makes it possible for the company to call upon workers within its own organization for almost any needed purpose, which furnishes an elastic, efficient and mobile force.

Another matter to which much attention has been given in these organization meetings is that of load distribution which is to say, of equalizing as far as possible the demands for power for industrial purposes. Conferences have been held with manufacturers to readjust the closing hours and the changes of working shifts. By these means the peak load will be lightened and more current will be consumed during other hours.

The announced purpose of the company is to place itself in readiness for whatever service the government may require, and yet remain responsive to the demands of the communities its properties serve.

The necessity for doing all these things is made plain in a statement by President A. W. Leonard to the public, to public officials and to the officers, heads of departments and employes of the company which appears elsewhere in this issue.

Aside from the lesson of patriotic preparedness suggested in the outline of the policy of the Puget Sound Traction, Light & Power Company during the period of the war, there should be enforced limitation of expenditures for public improvements. Particularly should municipalities be slow to authorize the expenditure of moneys for projects not immediately necessary. The requirements of war finance should take precedent over all other developments.

The co-operation between consumer and central station at Seattle to lessen peak load demands and increase the load factor of hydroelectric plants is highly commendable and should receive similar adoption throughout the West. This is one very important way to serve the national government in its effort to conserve the fuel supply and put the energies of the nation to their best advantage.

The surprising development of the Southwest has been a source of much interest in financial and hydro-electric circles for many months past. Not only has this been true for the district in and about Los Angeles, but the interior states of Arizona and New Mexico have been coming to the front in a manner that can not fail to bring forth the commendation of all well-wishers of the West.

The great power plant at Ajo, Arizona, and the plant of the Inspiration Copper Mining Company are today establishing new records in efficient engineering practice. At Ajo, for instance, steam is being generated under 250 lb. pressure, thus establishing a new record for Pacific Coast practice.

In financial matters, too, these great commonwealths are coming to the front. Take, for instance, the recent showing of the Arizona Power Company. For March, 1917, the Arizona Power Company reports gross earnings of \$36,961.14, an increase of 70 per cent, when compared with the same month in 1916, with net earnings of \$25,841.88, or 73.1 per cent better than for March of last year. The operating ratio for the two periods was 30.1 and 31.5 per cent, respectively. For the twelve months ended March 31 last gross was \$357,573.20, compared with \$231,775.72 the year before, with net of \$94,039.24, against \$39,374.58, and an operating ratio of 32.1 per cent, or only 1.9 per cent greater than in the period before mounting costs became so noticeable. The results in March of this year indicate that the company has been able to control costs and henceforth operating expenses should decline, as there is an increasing demand for the power generated at its two hydroelectric plants, particularly from the mines around Jerome, Phoenix and adjacent camps, where operations are showing an increase. Through a subsidiary, the Prescott Gas & Electric

Arizona Power Earnings Increase

Company, Arizona Power also supplies gas and electricity for power and light to Prescott

Arizona has in recent years taken first place in copper production of the United States, having passed the great treasure state of Montana in this regard some years back. Meanwhile its agricultural development is fast gaining in productive results, and never before in its history has the general stability of this commonwealth been on a better footing.

For some time back those who have been in close touch with financial and industrial matters in the Northwest have noted with increasing satisfaction the renewal of business activity on all sides. Some details of this activity along electrical lines will undoubtedly be of much interest to our readers.

The Great Awakening in the Northwest

Industrial conditions at Portland and vicinity have been greatly improved recently as a result of the activity in ship building and allied industries. The Portland Railway, Light & Power Company has added 4500 kw. in motors and industrial lighting as a direct result. The Northwestern Electric Company reports a corresponding increase in electrical installations and a large extension in their district steam heating system as a result of the advancing prices of fuel oil.

The North Coast Power Company has met with such success in supplying reclamation districts in flooded lands north of the Columbia River that it contemplates an ultimate diking and reclamation of nearly 60,000 acres. Another feature of interest in this territory is the possibility of using vast areas of lignite in the vicinity of Chehalis, Wash., as the basis for making a water gas which can be readily transmitted to Portland and Seattle. The coal-tar by-products are today equally as valuable as the gas produced.

The Pacific Power & Light Company has started construction on a 62-mile tie line from Pasco to Lind, Wash., which will connect its system with that of the Washington Water Power Company. This line will be constructed with sufficient spread of the wires for ultimate operation at 110,000 volts. A No. 0 copper circuit is employed. A new switching station and a 5000 k.v.a. synchronous condenser are also to be in-

stalled. This company is also constructing a steel tower crossing of the Columbia River between Hood River and White Salmon. The crossing will be about 1993 ft. in length, the conductor being $\frac{5}{8}$ in. plow steel galvanized wire.

The city of Seattle has issued specifications for the construction and delivery to the city of a complete hydroelectric plant as an extension to the municipal electric light and power system. Bids will be received until July 20th. The plans call for 13,000 kw. of continuous energy at an estimated cost of \$3,000,000. The successful bidder is to accept the city's 20-year bonds in payment.

The Washington Coast Utilities Company has just been organized by Warner Marshal of Boston, Mass, to operate the properties formerly belonging to the Northwest Electric & Water Works at Montesano and Elum as well as the plants at Arlington, Stanwood, Edmonds and Vashon Island, Wash. Extensive plans have been made for improvement, including the installation of a 500 kw. steam turbo generator at Montesano.

The Olympic Power Company at Port Angeles, Wash., has contracted to furnish 4000 kw. to a new paper mill being built at Port Angeles. As a side light on governmental activity in power installation a trade note is interesting. The Seattle office of Chas. C. Moore & Co. has the contract to install a 200 kw. steam plant for a governmental radio station at Keyport, Wash.

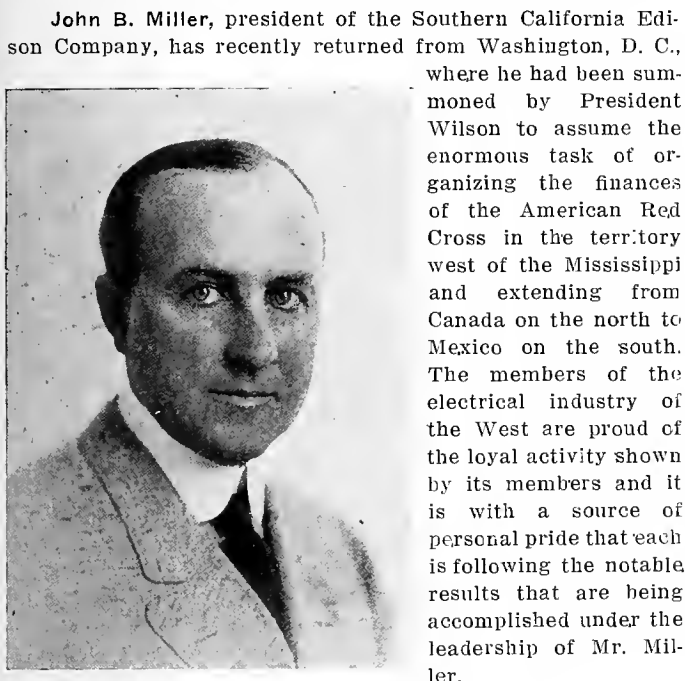
Recent increases in the consumption of power in the vicinity of Seattle have taxed the capacity of the Puget Sound Traction, Light & Power Company. The company is installing a new 15,000 kw. unit in its White River hydroelectric and a 10,000 kw. steam unit at Georgetown. At the present rate of increase this additional power will be needed before the installation can be completed. Especial attention is being paid to secure the co-operation of consumers in reducing peak load demands.

Such beginnings as these presage an unprecedented renewal of hydroelectric activity on all sides. They augur much for increased confidence in industrial and agricultural stability in this great productive section of the United States.

THE NEW JOURNAL SERVICE: It is with deep and heartfelt appreciation that the Journal of Electricity acknowledges the many expressions of commendation that continue to come into the editorial department concerning the ambitious new activities it has undertaken since the first of the year. These letters, coming as they do from presidents of universities, professors of electrical engineering, central station managers and engineers in the highest standing throughout the West, combined with beautiful expressions of approval from manufacturers, manufacturers' agents, and contractor dealers, encourage us to make even more ambitious moves for the coming issues.

C. E. Grunsky, the well-known consulting engineer, will head a department devoted to the discussion of rates which will cover vital points that are now perplexing evaluation experts. A. E. Chandler, of the California Water Commission, one of our best known authorities on Western Water Law, begins a series of discussions with this issue on recent advances in this important branch of technical knowledge so necessary in hydroelectric development of the West. In addition to all these good things a host of other details are now in their planning that will not only maintain this Journal as one of the best published—but it even aspires to become on a plane so unique and so helpful as to be in a class by itself. If you approve of its course and of its ambitions, it most sincerely solicits your continued good will and expressions of appreciation.

PERSONALS



John B. Miller, president of the Southern California Edison Company, has recently returned from Washington, D. C., where he had been summoned by President Wilson to assume the enormous task of organizing the finances of the American Red Cross in the territory west of the Mississippi and extending from Canada on the north to Mexico on the south. The members of the electrical industry of the West are proud of the loyal activity shown by its members and it is with a source of personal pride that each is following the notable results that are being accomplished under the leadership of Mr. Miller.

H. S. Hartzell of Baker-Joslyn Company of San Francisco, has recently been at Seattle.

W. A. Brackenridge, vice-president and general manager of the Southern California Edison Company, is in the East.

J. L. Husman, superintendent of the San Francisco branch of the American District Telegraph Company, is at Seattle.

Oswald West, ex-Governor of Oregon, has been appointed receiver of the Home Telephone & Telegraph Company at Portland.

H. L. Vorse, electrical inspector of the Oregon Insurance Rating Bureau, is making an inspection trip in and about the city of Klamath Falls.

William M. Strong, of Denver, Colorado, is resident engineer for the Arno'd Company in charge of hydroelectric surveys near Sultan, Washington.

A. M. Sherwood, Jr., formerly of the General Electric Company, Portland, Oregon, has resigned to become president of the Coast Ship Building Company, Portland, Oregon.

F. D. Weber, electrical engineer of the Oregon Insurance Rating Bureau of Portland, Oregon, and Portland representative of the Journal of Electricity, was a recent Seattle visitor.

E. W. Moreland, who has been with the Oregon Public Service Commission for four and a half years as engineer in the department of railways, left the service recently by resignation.

C. E. Grunsky, Jr., recently commissioned captain in the Engineer Officers' Reserve Corps, is now actively engaged as chief of construction in building the new cantonment near San Diego, California.

Geo. Brown of Chelan, Wash., has been superintending the affairs of the Wenatchee Gas & Electric Company of Wenatchee, Wash., since the death of Arthur Gunn, which was announced in the last issue of the Journal.

Carl E. Johnson, manager of the U. S. Electrical Manufacturing Company of Los Angeles, is back again in Los Angeles after an enjoyable honeymoon trip by automobile up through California to San Francisco, thence by boat to Seattle and Portland.

C. E. Stevens, manager illuminating section of the supply division of the Westinghouse Electric & Manufacturing Company, and L. A. S. Wood, special representative of the Geo.

Cutler Company, have been in California, Oregon and Washington during the past two weeks.

Clyde A. Malone of the California-Oregon Power Company has been ordered into the training camp as a captain of the coast artillery.

R. M. Boykin, engineer for the North Coast Power Company of Portland, Ore. has been elected vice-president and appointed general manager of the company following the resignation of H. L. Harries, who is at the military training camp at the Presidio.

Robert Sibley, editor of the Journal of Electricity, as guest of honor recently addressed a gathering of some sixty young engineers in Berkeley, California, on the present opportunities of service for the engineer. Among the group were many of his former students.

B. M. Woods, assistant professor of theoretical mechanics, and B. F. Raber, associate professor of mechanical engineering at the University of California, have returned from a governmental commission to Toronto and are assisting in instituting a curriculum on military aeronautics at the State University.

B. W. Collins, manager of the Montesano plant, recently acquired by Warner Marshal of Boston, Mass., now represents Mr. Marshal, while F. D. Nims, formerly engineer and assistant general manager of the Olympic Power Company, has also joined the Marshall organization and is expected to return to Seattle about July 1st.

Lewis Linn McArthur, son of general manager Lewis A. McArthur, is the latest acquisition to the managerial force of the Pacific Power & Light Company of Portland. From latest reports it would appear that this little nine-pounder is adding his quota in building up the splendid esprit de corps of this organization.

George A. Damon, dean of engineering at Throop College of Technology, has submitted a comprehensive plan for San Jose's transportation problems. The plan takes into account the coming electrification and joint operation of all railroad lines into the city and provides for its social, religious and educational growth.

A. H. Griswold, plant engineer for the Pacific Telephone & Telegraph Company, has received a commission as major in the Engineer Reserve Officers Corps and has left for Monterey, Cal. to receive preliminary training in order to prepare for an early departure to France to serve in the signal corps of the U. S. Army.

Samuel Insull, president of the Commonwealth Edison Company of Chicago, received the honorary degree of Doctor of Science at the one hundred and twenty-first commencement exercises of Union College, Schenectady, N. Y., held June 11th to 13th, 1917, in token of his work as an organizer and administrator, successful in establishing a vast industry.

W. D'A. Ryan, illumination engineer of the Panama-Pacific International Exposition at San Francisco in 1915, has



contributed a noteworthy paper to the American Institute of Electrical Engineers on the lighting effects of the exposition. The unique and interesting feature of the paper is the series of beautiful colored plates that are exhibited, showing in many details the gorgeous and inspiring night views that were the subject of such world-wide comment during the exposition and which have since ushered in a new era in electrical illumination. The colored plates are being sent out with the June proceedings

of the American Institute of Electrical Engineers.

John A. Britton, vice-president and general manager of

the Pacific Gas & Electric Company, in addition to his present duties on the California State Council for Defense, will also serve on the national committee on gas and electric service of which John W. Lieb of the New York Edison Company is chairman. The committee is recognized by the Advisory Commission of the Council of National Defense as one of its advisory committees, and it has established an official headquarters in the Munsey Building, Washington, D. C.

George C. Holberton of the Pacific Gas & Electric Company; Col. H. V. Carter, formerly president of the Pacific States Electric Company; T. E. Bibbins, president of the Pacific States Electric Company; W. S. Berry, Western sales manager of the Western Electric Company; E. . Cutting, Western manager of the Edison Storage Battery Supply Company; Lee H. Newbert of the Pacific Gas & Electric Company; and R. M. Alvord of the General Electric Company, all of whom are past presidents with the exception of Mr. Alvord, who is the present active president, made beautiful and stirring addresses at a recent meeting of the San Francisco Electrical Development & Jovian League in which the possible patriotic effort of the league in the national crisis was most forcefully brought out.

J. D. Galloway, a consulting engineer of San Francisco, has been appointed chairman of a committee on engineering and inventions for the California Council of Defense. Other engineers on the committee are George A. Damon, dean of engineering, Throop College of Technology; G. W. Dickey, consulting naval architect; Frank Rieber, chief engineer Rieber laboratories; C. L. Cory, professor of electrical engineering, University of California; C. R. Weymouth, chief engineer Chas. C. Moore & Co.; Harris J. Ryan, professor electrical engineering, Stanford University; Guy Bailey, consulting engineer; and Dr. Thomas Addison, Western manager of the General Electric Company.

OBITUARY

Frank L. Stearns, electrical engineer for the Chicago, Milwaukee & Puget Sound electrification, died recently as the result of inhaling gas and smoke caused by the burning of insulation in the substation of the East Portal of the long tunnel of the company in western Montana.

NEW BULLETINS

The V. V. Fillings Company of Philadelphia have just issued a pamphlet on safety first switches.

"Gifts Electric" is the pleasing title of an artistic and helpful suggestion booklet just issued by the National Electric Light Association.

Progress in water works pumps is set forth in a recent attractive forty-eight page booklet by the De Laval Steam Turbine Company of Trenton, N. J.

The latest pamphlet illustrating the No. 318 Simplex Pole Jack shows this efficient pole puller in actual operation together with other useful information.

"Home Sanitation" is the title of a leaflet issued by the United Electric Company of Canton, Ohio, setting forth advantageous use of the electric cleaner.

"Keep Business Going," is a new leaflet issued by The Society for Electrical Development, Inc., to assist in bettering business for the entire electrical industry.

The Electrical Utilization Safety Orders issued by the Industrial Accident Commission of the State of California have been revised as of date July 1, 1917, and are now on distribution.

The embrittling action of sodium hydroxide on soft steel by S. W. Parr is the subject matter of bulletin 94 just issued by the engineering experiment station of the University of Illinois.

The Western Electric Company has issued a most attractive pliable bound series of leaflets on window display

service that will aid the contractor and dealer immensely in properly marketing their goods.

"Reforestation on the National Forests" is the title of bulletin 475 of the Department of Agriculture. This bulletin should prove very helpful to hydroelectric companies that have large water sheds to safeguard.

The U. S. Electrical Manufacturing Company of Los Angeles has issued a large leaflet describing a self-contained motor-driven grinder which should be of interest to all interested in an electric grinding and buffing tool.

"New and Used Machinery" is the title of a thirty-page pamphlet by Gray and Barash of Seattle, Washington. In this publication useful information is given along electrical and hydraulic lines for purchase and sale of such machinery.

The General Electric Company has issued two-color leaflets on "Individual vehicle taper charging set with automatic panel"; "Tungar Rectifier," a new battery charger for use with alternating current; and "Small battery charging outfits."

The Union Electric Company of St. Louis has published a most attractive booklet 7 by 16 inches on the subject of electric service editorials that set forth the strong features of the public policy of that company in dealing with its consumers in St. Louis.

In line with the aggressive activities of the Society for Electrical Development, Inc., to help build up better advertising and merchandising methods for its members, it issues a monthly sales service. This service has been a decided hit since its inauguration in February. Each sales service is different from the other and the aim is to put into this service only material that will interest all, or nearly all, of the electrical businesses, such as manufacturers, central stations, jobbers and dealers.

BOOK REVIEWS

Examples in Battery Engineering. By Professor F. E. Austin. Size 5 by 8 in.; 90 pp.; 40 illustrations; cloth binding. Published by the author and for sale at the Technical Book Shop, San Francisco. Price \$1.25.

The increasing use of primary and storage cells at the present time, and the greatly extended applications possible in the future, is a valid reason that engineering students as well as those engaged in professional practice should have adequate knowledge of the fundamental principles forming the foundation of "battery engineering."

This little book is divided up into sixteen lessons on all the important phases of battery engineering and closes with a list of helpful references. Some twenty odd examples are completely solved. Illustrations and tables assist the reader in getting a grasp of the subject. This simple little book should appeal to all those having to do with this new and growing departure in electrical science.

Electric Railway Transportation. By Henry W. Blake and Walter Jackson. Size 6 by 9 in.; 487 pp.; 120 illustrations; cloth binding. Published by McGraw-Hill Book Company of New York City and for sale at the Technical Book Shop, San Francisco. Price \$5.00.

Here is a book on transportation methods and practice of electric railways. Since men engaged in the transportation department of an electric railway greatly exceed in number those in the engineering department, and the opportunities for financial loss through faulty practice are at least as large if not larger, this work should fill an unusual mission in the electric railway field. The authors who are editor and manager, respectively, of the Electric Railway Journal, have had wide and varied opportunities in collecting data for this book. The chapter on freight and express business should prove especially helpful to engineers and traffic managers throughout the West as the need for increased business along these lines is growing in importance each day.

MEETING NOTICES FOR ELECTRICAL MEN

(The one meeting of the immediate future upon which all eyes are fixed is that of the convention of The California Association of Electrical Contractors & Dealers at Santa Cruz, July 11-14, 1917. Not only are the contractors themselves enthusiastic over its success but jobbers and central station men are actively assisting in making the meeting an unprecedented success. Of the meetings recently held in various districts of the West that of the Pacific Gas & Electric Employees Association in San Francisco, and the Pacific Coast Gas Association in Los Angeles have proved immensely helpful and inspiring. The reorganization of the Southern California Edison Company still holds the attention of the western hydroelectric fraternity. Other meeting notices will also be found in the following lines.—The Editor.)

California Association of Electrical Contractors & Dealers

The great event of coming interest in Central California during the coming semi-monthly period is the annual convention of the California Association of Electrical Contractors and Dealers. The convention is to be held at Santa Cruz, July 11-14, 1917.

It is anticipated between three and four hundred will be in attendance. From reports so far received from various parts of California, it would seem the above estimate is not far out. Contractors and dealers from the Sacramento and San Joaquin Valleys have expressed their intention of being present. Southern California is to send a delegation, while the cities of Stockton, Santa Rosa, San Mateo, and many others, will be represented.

Representatives of central stations in various parts of the state of Nevada, as well as many Electrical Supply Jobbers, are to be on hand.

Program

Wednesday, July 11, 2:30 p. m.
Opening of the Convention.
Reports of officers and standing committees.

Thursday, July 12, 9:00 a. m.
"Engineering Features of Electrical Construction as applied to Contracting"—paper by Mr. C. F. Butte.
2:00 p. m.—"Retailing and Merchandising"—paper by Mr. L. Levy, followed by a practical demonstration on "Constructing a Newspaper Ad" by H. W. Lemmon, of the Truckee River General Electric Co., Reno, Nevada.

Mr. Lemmon is a graduate of the newspaper world and eminently fitted to show the retail man some points in preparation of advertising copy for newspaper use.

Friday, July 13, 9:00 a. m.
"The Business Phases of Electrical Contracting," by Mr. H. C. Reid.

After a discussion of this subject, Mr. C. C. Staehling will set forth "Some of the Essentials of Cost Accounting," treating in detail the subject of "Overhead" and "Depreciation." If you don't know what Overhead is, or think you have only a small one, and Depreciation does not come your way, just attend this session and see where you stand.

Saturday, July 14.

8:30 a. m.—Election of officers.

1:30 p. m.—An open session. Addresses by various leaders in the electric industry. At this session, Mr. Albert Elliot will talk on "The Electrical Contractor, East and West." Mr. Elliot has just returned for an extended trip throughout the East, during which time he was in direct touch with the Eastern electrical men, and will tell you first hand of conditions as he saw them.

7:00 p. m.—Annual Banquet.

The ladies are expected to be present this year and ample provision has been made for their entertainment under the able direction of the entertainment committee. There will be a swimming contest; night on the beach, with entertainment and refreshments; an afternoon at the Big Trees in which all are expected to join; games, races, open-air dancing, etc.; an open to all dance Wednesday evening, and the regular

Association Ball, Thursday evening at the Casino Concert hall. There is going to be lots of opportunity for swimming, fishing and golfing, so come prepared.

The convention committee consists of Mr. M. A. De Lew, chairman; Messrs. T. Bennett, E. E. Brown, W. E. Hayes, H. C. Reid. The entertainment committee: T. Bennett, M. L. Scobey, J. W. Asher, A. E. Rowe, M. S. Orrick. The pro-

gram committee: H. C. Reid, C. B. Kenny, H. W. Kimball, R. E. Fisher, C. A. Parmelee, R. L. Cardiff, M. A. Cain, W. Cox, J. C. Geyer. Ways and means committee: E. E. Brown, C. F. Butte, P. Decker, L. Levy, H. P. Stowe.

San Francisco Electrical Development & Jovian League

The League meeting for Wednesday, June 13, was given over to a discussion of the submarine menace under the leadership of Lieutenant Howell, U. S. N., now superintendent of the National Ice Company in San Francisco. The members were told in a most entertaining and interesting manner just how the submarine is built, how it operates and what the chances are of its being put out of commission.

On Wednesday, June 20th, C. F. Stern of the California Highway Commission spoke of the magnificent system of highways that have been built in California at a cost of thirty-three million dollars and referred in a forceful manner to the splendid fruitage that is now the heritage of the people of the state in the resultant

spirit of neighborhood feeling and co-operation in all communities of the state. A. Youngholm of the Electric Railway & Manufacturers' Supply Company acted as chairman of the day.

The last meeting of the League for the spring season, a thoroughly representative gathering, was held June 27. It was one long to be remembered. All the presidents from the incipency of the League some six years back, were either present in person or by proxy. Patriotic remarks were the order of the day. It was voted that a committee be appointed to keep in touch by correspondence with all League men entering the national service.

The Red Cross Committee reported that the five hundred dollar pledge of the society had been more than met in the nature of five hundred new memberships. The meeting adjourned with three rousing cheers for Captain Baker, and Captain Malone, who were present for perhaps their last time before leaving for France.

BUILDERS OF THE WEST—VIII



M. M. O'SHAUGHNESSY

The growth of an empire is largely measured by the breadth of vision displayed in the building of its great municipalities. The material engineering accomplishments in the erection of dams that to the beholder almost pierce the very sky above, or in the driving of tunnels that establish records in municipal attainment hitherto unaccomplished in municipal effort, attract the eye and call forth the admiration of all beholders. But to M. M. O'Shaughnessy, city engineer of San Francisco, this issue of the Journal is dedicated not so much for these actual material accomplishments as for that breath of vision possessed by this builder which gives to the younger generation such an inspiration for higher actions.

Pacific Service Employees' Association Banquet

The Palace Hotel on the evening of June 14 was a brilliant affair with over 600 employees of the Pacific Gas & Electric Company present. It was a most patriotic evening, in which all sang the national airs. The original song "We Will Stand by Uncle Sam," composed by H. J. Ridgway of Marin district, was one of the hits of the evening. Interesting tableaux showing the spirit of 1776, 1861 and 1917 were given, the success of which is largely attributable to the energetic work of R. E. Fisher. Remarks were made by Henry Bostwick, chairman of the association, and A. F. Hockenheimer. Attorney General U. S. Webb, ably introduced by Senator Cullen, gave an intensely interesting summary of relations between public utilities and the American people.

J. A. Britton in his characteristically able manner reported on his recent trip to the national capital, and the progress made in obtaining government permission for utilizing hydro power.

The New Southern California Edison Company

The total capitalization of the enlarged Southern California Edison Company is now approximately \$77,000,000—divided into \$38,000,000 of stock and \$39,000,000 of bonds, debentures and notes.

With the annexed territory of the Pacific Light & Power Corporation the Southern California Edison Company now serves over one hundred cities, towns and intervening rural communities with a population of approximately 1,250,000. It has 175,000 consumers and operates the following properties.

- 16 Hydroelectric plants of 156,500 h.p.
- 8 Steam plants of 141,770 h.p.
- 138 Substations.
- 1232 Miles 150,000 volt transmission tower lines.
- 188 Miles 60,000 volt steel tower transmission lines.
- 1608 Miles other transmission lines.
- 5213 Miles distributing lines.
- 2 Gas plants of 1,650,000 cubic feet daily capacity.
- 101 Miles of high pressure gas mains.
- 9 miles of electric street railway.
- 56 Miles steam railroad.

The vast geographical domain touched by the greater Edison system and in which electricity is generated and sold, includes the entire territory of Southern California and in addition, the great kingdom of the San Joaquin Valley, now only in the early stages of development.

The territory in which electricity is now distributed for light, heat and power purposes aggregates 43,978 square miles in ten counties, or more than the combined area of Massachusetts, New Hampshire, New Jersey, Vermont, Rhode Island, Delaware and Connecticut. In this enormous field there is almost infinite possibilities for productiveness by the application of electricity to agriculture, manufacturing and the domestic uses, which bring living up to the highest standard and accelerate the growth of cities and towns and populate with prosperous homes the intervening farm lands.

To make this splendid region respond to the electric thrill and to make it intensely electric is the magnificent opportunity for the men of the greater Edison.

It has been officially announced that it will be the policy of the company to reckon the terms of service of the men who come into the Edison organization, from the Pacific Light & Power Corporation from the time they entered that service, the same as in the case of the original Edison employees. In this spirit the new men enter the organization to co-operate with their associates in the big task that is before them all.

About six years ago the company, on account of its increasing size, found it necessary to add to its general offices. This was accomplished by leasing an entire floor in the San Fernando Building which is adjacent to the Edison Building. At that time it seemed that this additional office room

would provide for the growth of the company for practically an indefinite length of time. However, after this comparatively short time the company is again compelled to seek additional accommodations. The old Edison Building is now only of sufficient size for the administrative, legal, general agent, treasurer and accounting departments, including also the Los Angeles district business office. The rooms in the San Fernando Building now house the operating, engineering record, purchasing and inventory departments.

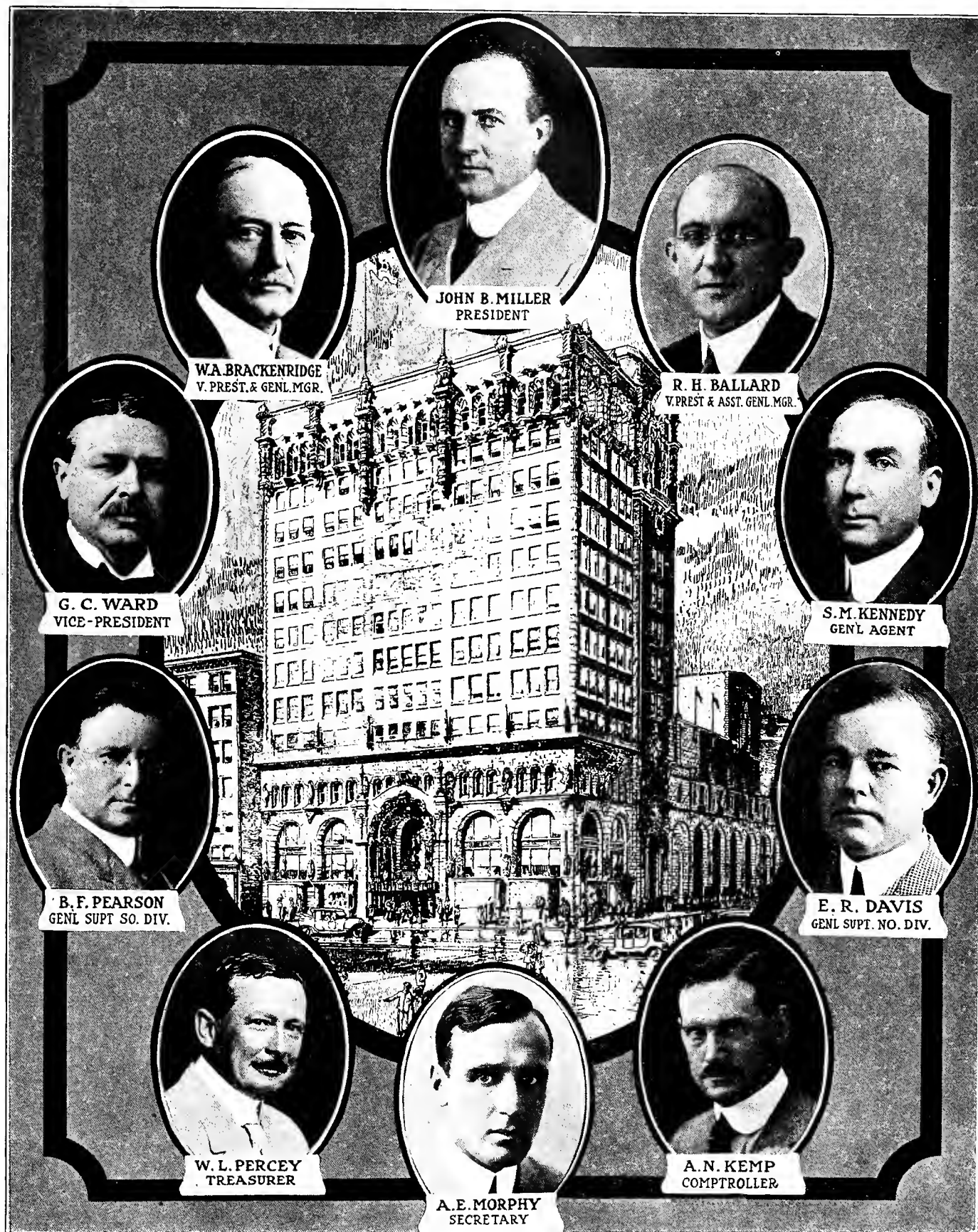
The new structure which is to form the future home of the Southern California Edison Company is located at the southwest corner of Third street and Broadway, Los Angeles. This building will occupy 120 ft. on Broadway and 194 ft. on Third street. The entire first floor will be given over to a large modern theater with a seating capacity of 3000. The portion of the building fronting on Broadway will be carried to a height of twelve stories and it will be the top eleven floors of this section that will be occupied by the company. As each floor will have an area of approximately 5200 square feet it is seen that these new accommodations will be ample to care for the company's present needs, leaving a considerable margin to take care of the future growth that is certain to come. This building was commenced under the name of the Stability Building, but since the leasing of practically the entire office space by the company, it has very appropriately been decided to abandon the original name and call the new structure the Edison Building.

In its structural features the New Edison Building will be strictly fireproof in every respect. It will have a steel frame thoroughly fire-proofed by concrete; the floors, partitions and walls being reinforced concrete. The exterior will be after the ornate Spanish Renaissance order, the face, being of variegated tapestry brick and old ivory terra cotta. The cornice will be capped with eleven revolving electric flambeaus. The entrance to the company's quarters will be on Third street where there will be a handsome marble vestibule and lobby. In this lobby will be located three modern high speed electric elevators, serving the floors above.

In the arrangement of the various offices of the departments and also in the relative location of the departments, every thought is being given to obtain a layout that will make for the greatest possible convenience and efficiency. On the top floor will be located the president's offices with the legal department, and a spacious directors' room adjoining. On the floor below will be the offices of the general manager, the vice-presidents, the comptroller and the secretary. The accounting, operating and engineering departments will each occupy an entire floor.

All interior partitions are to be made of clear plate glass above a height of three feet so that the one in charge of the department will at all times have in view all of the men under him. The floors of the offices will be covered with cork linoleum, while the corridor floors will be of marble. All floors will have suitable locker rooms and lavatories and will be supplied with steam heat, hot and cold water, etc.

In the illumination of both the interior and exterior of the building, no effort will be spared to make it perfect in every respect. The interior lighting will be indirect and will be so designed that a uniform intensity of light, practically without shadows, will be obtained at all points. The entire exterior of the building will be flood lighted, the details of the system being worked out on a scale never before attempted. In this connection it is interesting to note that plans are now under way for the illumination of Broadway. These plans are being worked out along the lines followed in the lighting of Market Street, San Francisco's "Path of Gold." When completed, the Broadway lighting will far surpass anything else of its kind and it is very fitting that the new Edison Building will be its best lighted edifice.



THE OFFICERS OF THE REORGANIZED SOUTHERN CALIFORNIA EDISON COMPANY

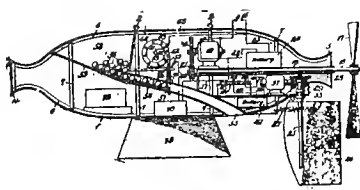
Here is a group of leaders in utility thought in Southern California, encircling the beautiful new building of their company. With its twelve hundred miles of 150,000 volt transmission tower lines, its eight steam plants of over one hundred and forty thousand horsepower, its sixteen hydroelectric plants of over one hundred and fifty thousand horsepower, and its splendid personnel in the way of executive talent, this organization presents to the hydroelectric fraternity of the nation an unusual and striking setting.

WHAT WESTERN INVENTORS ARE DOING

(The utilization of the earth's field of magnetism has long been the dream of inventors. Below is a brief setting forth of a recently invented aerial torpedo wherein means are provided for responsive directorial effort from the earth's magnetization in order to maintain a predetermined course for a torpedo. Other inventions are an automatic block signal apparatus, a dynamometer, an automatic circuit-closer for electric heaters and a train-stopping apparatus.—The Editor.)

1,228,281. Aerial Torpedo. Clarence Barrett, Salt Lake City, Utah, assignor, by direct and mesne assignments, of one-third to George Morrow and one-third to Robert W. Salisbury, Salt Lake City, Utah.

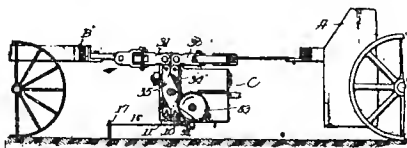
An aerial torpedo provided with means for sustaining it in the air, means for propelling the torpedo structure pro-



gressively, means responsive to earth magnetism for maintaining a predetermined course of the torpedo structure, means for releasing destructive devices at a predetermined point in the progressive movement of the torpedo structure, and means for causing the destruction of the torpedo structure.

1,228,299. Dynamometer. Jay B. Davidson, Davis, Cal.

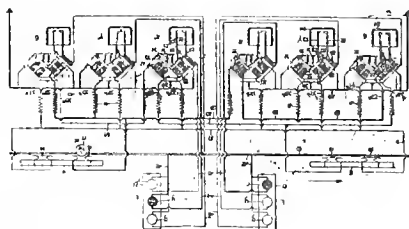
A dynamometer comprising two separate parts, means for resisting separation of the parts, a recorder mechanism ar-



anged for movement in accordance with the distance of dynamometer travel, a co-operating recorder mechanism for movement in accordance with relative displacement of the parts, the mechanism co-operating to record the operation of the dynamometer, and means for automatically actuating the first recorder mechanism through a predetermined distance of travel.

1,228,168. Automatic Block-Signal Apparatus. Virgil Webb Baumgartner, Salt Lake City, Utah.

The combination of track rails, with a block signal system independent of the track rails and comprising a clear signal at the entering end of the block and a clear and a danger



signal at the leaving end of the block, a switch for each

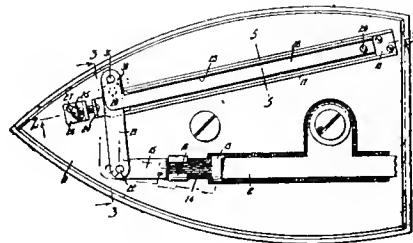
A dynamometer comprising two separate parts, means for closing the clear signal switches as a car is leaving the block

for setting clear signals, electrical means for closing the danger signal switch and opening the clear signal switches as a car enters the block, whereby a danger signal is given at the far end of the block, each switch including an electromagnetically operated movable contact for opening the switch, and an electrically operated lock movable to and from a position for holding the movable contact in open position.

1,228,195. Automatic Circuit-Closer for Electric Heaters.

Michael Hough Farley, Seattle, Wash., assignor of one-half to Arthur W. Kah, Seattle, Wash.

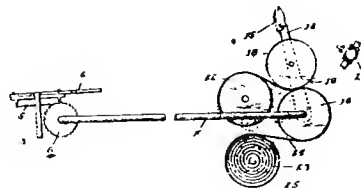
A thermostatic circuit closer, the combination of relatively fixed and movable contact members, a lever having longer and shorter arms, the longer arm being connected to



the movable contact member, a pair of expansion members arranged parallel to each other, one of the members being anchored at one end and the other member being anchored at its opposite end, and means to connect the otherwise free ends of the expansion members to the lever whereby the effect of the expansion of one member acting upon the lever will be added to that of the other expansion member.

1,227,866. Train-Stopping Apparatus. Aden M. Worden, Phoenix, Ariz.

Automatic train stopping apparatus, the combination with a valve connected in the brake pipe and normally closed, of a lever capable of swinging movement toward the valve and adapted to engage the valve to open the latter, a shaft, a connection between the shaft and lever whereby the latter



may be swung in the rotation of the shaft and operable to disconnect the lever from the shaft so that the lever may be restored to normal position, driving connections between the shaft and one of the drive wheels of the engine whereby the shaft will be rotated at less speed than the drive wheel of the engine so that the lever may be swung to open the valve after the train has traversed a prescribed distance.

NEW ELECTRICAL DEVELOPMENTS

(The most important new electrical development of the past semi-monthly period is the announced intention of the Pacific Gas and Electric Company to proceed to the construction of the rather unique power plant at the outlet of the Spaulding Dam. This power house will develop some 5000 horsepower and the head under which it will operate will be variable, depending upon the height of water impounded in the great Spaulding Lake, thus overcoming a hitherto unencountered variable in power development. Other items of interest follow.—The Editor.)

FINANCIAL

OAKLAND, CAL.—An offer of \$850 by the attorneys for the Great Western Power Company, to compromise the city of Oakland suit for delinquent franchise tolls of \$100,000 has been received by the city council of Oakland.

ANDERSON, CAL.—At a meeting the directors of the Anderson-Cottonwood irrigation district announced that the irrigation bond issue of \$575,000 had been duly validated, although no written notice has been received by Secretary Earl Downing. It developed the directors will not immediately sell the full issue, but will sell about \$350,000 for immediate use. This amount it is expected will be available between July 1 and 10.

LASSEN, CAL.—The board of directors of the Baxter Creek Irrigation District has ordered the issuance of bonds in the sum of \$310,000, and to publish sale of the same on July 2, 1917. Chief Engineer H. S. Martin will shortly have contracts for construction of the dam and canals ready for publication for bids. H. S. Martin, is chief engineer, Arad Way, assessor, and T. T. Gross, secretary of this pioneer district east of the Sierras.

SALEM, ORE.—The Public Service Commission recently issued the second of its orders covering rates on the Portland Railway, Light & Power Company, this order affecting the rates on commercial lighting and heating. The preceding order covered residence lighting and commercial power business.

Under the order issued today the rates of the company on those classes of business are decreased approximately from 5 to 10 per cent the order to become effective July 1. If the Northwestern Electric Company meets the reductions under the new order, as it met the reductions under the former order, it will not cause any material difference in the total revenues of that company, but will provide for an increase in some instances and a decrease in others to the customers of the Northwestern.

INCORPORATIONS

HANFORD, CAL.—The Laton Telephone Company of Hanford has been incorporated for \$10,000 by I. Tielman, T. D. Marshall and A. G. Smith.

SEATTLE, WASH.—The Canadian Electric Gun Company has been incorporated with a capital stock of \$150,000, by C. V. Winberg and T. J. Acheson.

SAN FRANCISCO, CAL.—The Tave Company has been incorporated for \$20,000 by A. E. Anderson 198 shares, and A. O. Dorey and W. H. Thormley 1 share each.

LOS ANGELES, CAL.—The Little Grant Heating and Lighting Company of Los Angeles, has been incorporated for \$100,000 by S. V. Halstead, D. S. Collins, A. L. Davison, G. H. Reimer and J. R. Edwards.

CORONA, CAL.—The Twin Buttes Water Company has filed articles of incorporation in Los Angeles with a capital of \$750,000. The company is composed of W. J. Hole and Samuel K. Sameson of Los Angeles, and T. C. Jameson, R. W. Voris, W. P. McClaskey, G. R. Freeman and Isabella Sargent of this city. The company has been formed for the purpose of supplying irrigation water for the 500 or more acres known as La Sierra Rancho, owned by W. J. Hole.

ILLUMINATION

OAKLAND, CAL.—The board of public works would install a lighting system in San Antonio Park at a cost of \$1500.

FRESNO, CAL.—The cost of installing an electrolier system on J street between Inyo and Los Angeles streets will be \$7194.

RIVERSIDE, CAL.—A contract for the installation of an ornamental lighting system on Main street from Tenth to Fourteenth street has been let to D. A. Tamplin on a bid of \$1925.

SANTA MONICA, CAL.—Bids have been received by the city council for lighting of Second street. They were: J. L. Wilson, \$1500; D. S. McEwan, \$1207; D. A. Tamplin, \$1377; Redondo Construction Company, \$1400.

LOS ANGELES, CAL.—The board of public works will receive sealed bids at the office in the city hall on or before June 22d for lighting of the San Pedro district for a period beginning July 1, 1917, and ending June 30, 1918.

RICHMOND, CAL.—To place electroliers on Macdonald avenue from First to Twenty-third street and to make the street as attractive as its importance demands, a new campaign for lighting has been inaugurated. The lighting committee has been appointed to meet with D. J. Collins and other interested merchants and Macdonald avenue property owners.

SAN DIEGO, CAL.—Reclamation of 732 acres of tide lands bordering Dutch Flats, which will be used as a site for a marine brigade post, is to be started before the end of the month, it is stated. The sum of \$600,000 has been appropriated for construction of sewers, water and lighting systems. A total of \$5,000,000 it is estimated, will be spent in the construction of buildings and wharfs and for shipment of these structures.

RIVERSIDE, CAL.—The city council has decided to take over the work of installing the ornamental lighting system on Main street, between Tenth and Fourteenth streets. The contract was let to D. A. Tamplin of Los Angeles on his bid of \$1925. The city's bid arrived at the meeting just one minute too late to be considered, but as it was considerable lower than that of the Los Angeles man, it has been decided to revoke the award of contract and authorize the city to do the work.

TRANSPORTATION

SALT LAKE CITY, UTAH.—Electrification of the Salt-air, Garfield and Western Railroad will start soon, the company having \$50,000 on hand for the work.

RICHMOND, CAL.—The city council has been instructed to confer with the Southern Pacific Company relative to a proposed electric franchise held for Cutting boulevard. The company was supposed to start an electric line on the boulevard some time ago.

SAN PEDRO, CAL.—Surveys are being made by the Pacific Electric Company of the Barton Hill district looking toward the carrying of the Bandino street line to a joining place with the Gardena line at some point near Pacific avenue junction. It is believed that the building of the new road will not be delayed.

GLENDORA, CAL.—The Pacific Electric Railway Company last week was surveying a route between Glendora and San Dimas for the extension of the Glendora line to make connection with the Los Angeles, Pomona and San Bernardino through line at San Dimas. Our information is that the Pacific Electric officials will push the project to completion with as little delay as possible.

SAN FRANCISCO, CAL.—Municipal Railway cars are expected to be running through Twin Peaks tunnel by the first of the new year. The board of public works has called for bids for the construction of the line from Market and Castro streets through the big bore to Sloat boulevard, a distance of more than three miles. The cost will be approximately \$45,000 for the trackage alone, and the work must be completed in five months.

SEATTLE, WASH.—Orders of the Washington State Public Service Commission requiring the Puget Sound Traction Company to run through cars on its Ballard Beach line in Seattle and increase passenger seating capacity on the Alki Point and Fauntleroy Park lines were in effect sustained and made operative recently by the supreme court, which affirmed dismissal of the traction company's suit to enjoin the orders, alleged to be unreasonable and confiscatory.

LOS ANGELES, CAL.—Plans that will mean millions of dollars to Los Angeles have been agreed upon by officials of the Pacific Electric Railway Company. The plans are for the building of street and freight cars at the new \$1,000,000 shops of the company at Torrance. The first order will be for 200 freight cars, costing about \$1000 each. After they are completed street cars and interurban passenger coaches will be constructed, these ranging in cost from \$10,000 to \$20,000 each. The decision to build cars in Los Angeles has caused extensive alterations in equipment of the plant at Torrance, and it is probable that the cost will exceed the original estimate of \$1,000,000.

TRANSMISSION

OKANOGAN, WASH.—The Okanogan Valley Power Company of Brewster, it is reported, will rebuild its distributing system within the corporate limits of Okanogan.

KINGMAN, ARIZ.—Tennant & Sladek have secured the contract for the new office and transformer building that is to be erected by the Desert Power & Water Company at Chloride.

COQUILLE, ORE.—Manager F. E. McKenna of the Oregon Power Company, announces that work will be begun on the construction of a power line from Marshfield to this city. The cost will be about \$25,000.

NEWPORT, WASH.—The Northern Idaho & Montana Power Company is erecting a 11,000 volt, three-phase, 60 cycle transmission line from Newport to Dalkena, Wash. The transformer station will have an initial capacity of 300 k.v.a.

SEATTLE, WASH.—The date for opening bids for the furnishing of a 500 kw. motor generator at Aloha street substation and four oil switches at the city steam auxiliary power plant has been extended by the board of works, from June 8th to June 22d.

CHLORIDE, ARIZ.—F. W. Wilde Jr. of the Desert Power & Water Company, states that his company will immediately begin construction of a transformer station here. The new station will be of concrete, two stories high and will involve a total expenditure of approximately \$12,000.

TACOMA, WASH.—The Wheeler-Osgood Company of Tacoma is planning to equip its sawmill for electrical operation which will increase the output from 150,000 to 170,000 ft. per day. The new equipment will include four 465 h.p. turbines, three boilers, one generator and one turbine. The cost of the work is estimated at \$60,000.

SEATTLE, WASH.—Bids will be received by C.B. Bagley, secretary of the board of public works of the city of Seattle, until June 29 for the furnishing of four oil switches for

the auxiliary steam electric station at Eastlake avenue and Nelson Place, and two transformers for a substation tie, one between the Seventh Avenue substation and the steam plant.

FRESNO, CAL.—A contract was let by the San Joaquin Light & Power Corporation for the erection of a 250 h.p. reciprocating booster pump station in the vicinity of Taft, Kern County. The station will be located about midway between Taft and Buena Vista Lake and will lift water from a lateral canal to the high lands near Taft. The cost of the plant will be about \$50,000.

CHEWELAH, WASH.—The Washington Magnesite Company has closed a contract with the Stevens County Light & Power Company of Colville for furnishing 1000 h.p. at its mine and plant near Chewelah. To furnish the service the power company will have to extend its transmission lines about 8 miles from Chewelah. R. S. Talbot of Spokane is president of the Washington Magnesite Company.

OLYMPIA, WASH.—The county commissioners have granted to the Puget Sound Traction, Light & Power Company, a franchise for a period of 25 years, for the construction of a transmission line from Brown's ranch to the log cabin in this city. The new construction will begin about where the Pacific Highway crosses the Nisqually River and work will begin at once according to the petition.

SALT LAKE CITY, UTAH.—Plans have been drawn and surveys made for a modern hydroelectric plant and a storage reservoir in Red Butte Canyon, to furnish light and power. The estimated cost of the proposed improvement, money for which Utah's delegation in congress is now trying to have appropriated by the War Department, is from \$100,000 to \$125,000. The engineers who prepared the plans recommend construction of a reinforced concrete dam.

WALLACE, IDAHO.—The Shoshone County Power Company, recently organized, proposes to erect and operate an electric transmission line from a point near the Ray-Jefferson mine and thence to Prichard Creek, down Prichard Creek to Murray, a distance of 12 miles, with laterals, branches and extensions, which will cost between \$30,000 and \$35,000. The line when completed will furnish energy for extensive dredging operations to be carried on along Prichard Creek by the Guggenheim interests.

TACOMA, WASH.—Bids will be received by H. F. Groen, commissioner of light and water, until July 2, 1917, for furnishing and delivering two lighting feeder panels with their appurtenant equipment, for installation in the city's substation, according to specifications on file in the office of the commissioner. Bids will also be accepted for the following as a whole or in separate items: Polished marble switch board material, voltage regulators, disconnecting switches, oil circuit breakers, insulated cables, fibre copper and bus bar copper.

FRESNO, CAL.—Congress has finally apportioned \$253,000 for the Yosemite National Park. This action will enable Manager Lewis to complete the new power plant this fall and to continue the building of the new roadway on an easy grade connecting El Portal with the park. Lewis now has 250 men, including 30 rangers, under him, and may add a few more after July 1. The power plant which he now expects to complete this fall will have a capacity of 2000 kilowatts, or 2667 horsepower. Located near Cascade Falls near the valley and up to Glacier Point, to light and furnish heat and power for the camps and hotels.

SAN FRANCISCO, CAL.—Further development of the Spaulding project has been started by the engineering department of the Pacific Gas & Electric Company, which is to install a power house about 600 ft. below the big Spaulding dam and generate 5000 additional horsepower. When the dam was installed this power house was one of the plans for the future development. With this plant in the chain the company will have approximately 72,000 horsepower from the Spaulding project. The power house, in which a big

turbine is to be installed, will be located about 600 ft. from the dam, and 5000 horsepower will be generated under a 173 ft. head of water. Heretofore this head has been going to waste, not generating power until it reached the Drumm power house. The development is in such a shape at the present time to allow of the installation of the adit and the saving of the waste. The new development entails a cost of about \$125,000.

TELEPHONE AND TELEGRAPH

NORTH YAKIMA, WASH.—The Woodhouse Telephone Company has applied for a franchise to construct a telephone line on certain county roads.

TOLEDO, ORE.—The Pacific Telephone & Telegraph Company plans the standardizing of the equipment of that company within the next 60 days. The cost will be about \$10,000.

SAN FRANCISCO, CAL.—C. L. Watson has applied for certificate of public convenience and necessity to construct a telephone system, before Examiner Encell at French Gulch.

PRESCOTT, ARIZ.—The Mountain States Telephone & Telegraph Company is surveying for a new telephone line between Prescott and Ash Fork, the line to be about 64 miles long.

SAFFORD, ARIZ.—There will soon be presented to the people of the lower portion of the valley a proposition looking to the installation of a telephone system covering towns on both sides of the river.

STOCKTON, CAL.—An ordinance has been passed granting the Pacific Telephone & Telegraph Company the right to erect and maintain poles, wires and conductors for the transmission of electricity upon the streets and alleys in city of Stockton.

WATSONVILLE, CAL.—The Pacific Telephone & Telegraph Company has applied for a 25 year renewal of its franchise, which has expired. The city clerk has been instructed to advertise for bids for a franchise, bids to be opened July 17th.

BRAWLEY, CAL.—Imperial Valley and San Diego may soon be connected by a long distance telephone line if plans of the Pacific Telephone & Telegraph Company are carried out. It is understood here that a third survey is being made for the company by engineers.

WINSLOW, ARIZ.—The Winslow telephone system owned and operated for many years by A. J. Henderson, has been sold to W. C. Cooley. It is understood that it is the intention of the new owners to immediately expend several thousand dollars in making needed improvements in the system.

STOCKTON, CAL.—The Pacific Telephone & Telegraph Company has been granted a 25 year franchise by the city council. For this franchise the company pays the city \$100 and 2 per cent of the gross annual receipts. Twenty-five main line telephones and 12 extensions are furnished to the city free of cost.

FRESNO, CAL.—Improvements to care for the present increase and future growth of the Pacific Telephone & Telegraph Company in this district are now under way and an appropriation of nearly \$50,000 has been made by the main office, according to announcement made by W. F. Lehigh, the local manager. Seven distinct improvements are being made in the system and the biggest part of the work will be completed within two months, while it will require at least 240 days on the work on the Fresno line.

IRRIGATION

WILLOWS, CAL.—Following a hearing the board of supervisors has declared the Jacinto irrigation district petition sufficient in every particular. The date of the final hearing was set for July 6th.

GRIDLEY, CAL.—Intimation that a compromise might be effected in the dispute between the Gridley Water Users'

Association and the Sutter-Butte Canal Company was given at the hearing before Railroad Commissioner Frank R. Devlin.

WILLOWS, CAL.—The board of supervisors has begun hearing the petition of the Princeton district to be declared an irrigation district. It was this district that failed by one vote when the matter was up before the people last year. The same steps must be taken as were taken before that election by the supervisors. The district has now been thoroughly canvassed and it is believed when the subject is again presented to the people to vote upon that it will carry with practically no opposition.

PROSSER, WASH.—The special election of interested property owners in Benton and Yakima counties under the Horse Heaven irrigation district, voted \$18,000,000 in bonds to complete the project. About 215,000 acres can be watered at \$45 per acre, 300,000 acres including reservoirs at \$87 per acre. The main canal will be 150 miles long. The first meeting of an advisory committee, elected recently, will be held with the board on July 3, at which time the rights of the Klickitat Irrigation & Power Company, the Northwestern Electric Company and Yearsley interests along the Klickitat river will be purchased. Prominent land owners claim the bonds can be sold as soon as validated. The engineers on the work are R. H. Thompson, Alaska building, Seattle; O. Laurgaard, Railway Exchange building, Portland, and A. J. Wiley, Butte, Mont. Some of the items of construction are as follows: One hundred and fifty miles of main canal, \$8,000,000; two power and pumping plants, \$500,000; six laterals, \$1,979,000. Apparently the \$18,000,000 does not provide for seven reservoirs originally contemplated under a \$24,000,000 bond issue, as these structures would cost a total of \$8,833,000. Attorneys for the district are: Farrell, Kane & Stratton, American Bank building, Seattle; McGregor & Frisbie of Portland, and R. B. Williamson of North Yakima, Wash'n'gon.

MANTECA, CAL.—H. F. Jackson, president of the Sierra and San Francisco Power Company, in a communication to the board of directors of the South San Joaquin irrigation district, stated that the Oakdale and San Joaquin districts could secure the increased flow from its storage system for irrigation purposes late in the season by paying the power company 50c per acre-foot. The power company, in order to let the irrigation districts have the water when they need it most, will draw on its reservoirs for the period from late in July through October and use its steam plants at the end of the season instead of earlier, as is usually the case.

OROVILLE, CAL.—Supervisor C. E. Porter, who has been active in interesting farmers of the section south of this city in an irrigation project, says the acreage necessary to insure the construction of a system has been pledged. Mr. Porter has submitted his report to the officials of the Great Western Canal Company and their action is awaited. It is said the contract is being considered. The plan under which Porter and Engineer Harry Cauthard of the canal company have been working calls for a mutual water district formed of land owners who desire water for their lands. The Great Western Canal Company asked a minimum subscription of 10,000 acres.

LOS ANGELES, CAL.—It is stated by J. S. Jarrett, attorney of Imperial, that the U. S. government has entered into a contract with the Laguna Water Company for the building of a canal from Laguna dam into the Imperial Valley for irrigation of the east side mesa. The mesa comprises 180,000 acres. A company headed by Col. Holabird, F. H. Merrill, O. E. Freeman and W. B. Baker propose to conduct the waters of Baldwin Lake and Whitewater River to Imperial Valley for irrigation and domestic water supply. They propose to conduct this water to an impounding dam in Morengo Valley and then to Coachella and Imperial Valleys by way of Palm Springs. Cities of Imperial Valley are asked to raise \$100,000 toward the project. Power plants are to be developed at the southern end of Morengo Valley and Palm Springs.

ALPHABETICAL INDEX TO ADVERTISERS

The letter and number before each name are used in the classified page preceeding

- | | |
|---|--|
| A-1 American Ever-Ready Works of National Carbon Co.
Los Angeles; 755 Folsom St., San Francisco; Seattle. | M-3 Moore & Co., Charles C..... 15
Van Nuys Bldg., Los Angeles; Spalding Bldg., Portland;
Kearns Bldg., Salt Lake City; Sheldon Bldg., San Francisco;
Mutual Life Bldg., Seattle; Santa Rita Hotel Bldg., Tucson. |
| B-1 Baker-Joslyn Company..... 2
71-75 New Montgomery St., San Francisco; 911 Western Ave., Seattle; 353 Second St., Los Angeles. | N-1 Nason & Co., R. N.....
151 Potrero Ave., San Francisco. |
| C-1 Century Electric Co..... 19
906 So. Hope St., Los Angeles; 56 Natoma St., San Francisco; 65 Front St., Portland, Ore. | N-2 National Conduit & Cable Co., The.....
Trust and Savings Bldg., Los Angeles; Rialto Bldg., San Francisco. |
| C-3 Crocker-Wheeler Co.....
87 New Montgomery St., San Francisco; 228 Central Avenue, Los Angeles. | N-3 National Lamp Works of G. E. Co..... 13
(All Jobbers.) |
| C-5 Crouse-Hinds Company
Syracuse, N. Y., U. S. A.
New York, Boston, Cincinnati, Chicago. | N-4 New York Insulated Wire Co.....
629 Howard St., San Francisco. |
| C-4 Cutler-Hammer Manufacturing Co..... 12
579 Howard St., San Francisco; Morgan Bldg., Portland, Ore.; San Fernando Bldg., Los Angeles. | N-5 Northwestern Pacific 14
Ferry Bldg., San Francisco. |
| D-1 Detroit Fuse & Manufacturing Co..... 3
1404 Rivard Street, Detroit, Mich. | N-6 National Carbon Co.....
Cleveland, Ohio. |
| E-1 Edison Lamp Works of General Electric Co.....
Rialto Bldg., San Francisco; 724 So. Spring St., Los Angeles. | O-1 Okonite Co. (The)..... 22
(All Jobbers.) |
| E-2 Edison Storage Battery Supply Co..... 14
206-8-10 First St., (near Howard), San Francisco. | P-2 Pacific States Electric Co..... 16
236-240 So. Los Angeles St., Los Angeles; 61-67 Fifth St. No., Portland; 200-210 Twelfth St., Oakland; 575 Mission St., San Francisco; 307 First Ave. So., Seattle. |
| E-3 Electric Agencies Co.....
279-283 Minna St., San Francisco; 419-421 E. Third St., Los Angeles. | P-5 Pierson, Roeding & Co..... 15
Pacific Electric Bldg., Los Angeles; Rialto Bldg., San Francisco; Colman Bldg., Seattle. |
| E-4 Electric Storage Battery Co..... 19
1536 Bush St., San Francisco. | P-7 Pittsburgh Piping & Equipment Co..... 22
Monadnock Bldg., San Francisco. |
| E-5 Electric, Railway & Manufacturing Supply Co..... 10
34 Second St., San Francisco. | S-4 Southern Pacific Co..... 18
Flood Bldg., San Francisco. |
| E-6 Electric Novelty Works.....
533 Mission St., San Francisco. | S-5 Sprague Electric Works..... 15
Rialto Bldg., San Francisco; Colman Bldg., Seattle; Corporation Bldg., Los Angeles; Electric Bldg., Portland; Paulsen Bldg., Spokane. |
| E-7 Economy Fuse & Mfg. Co.....
Kinzie and Orleans Sts., Chicago. | S-6 Standard Underground Cable Co..... 15
First National Bank Bldg., San Francisco; Hibernian Bldg., Los Angeles; Central Bldg., Seattle, Wash.; 815 Newhouse Bldg., Salt Lake City, Utah. |
| F-3 Federal Electric Company..... 11
618 Mission St., San Francisco. | T-1 Thomas & Co., R..... 18
Pacific States Electric Co. and Western Electric Co., Pacific Coast Representatives. |
| G-1 General Electric Co..... 20-21
724 So. Spring St., Los Angeles; Worcester Bldg., Portland; Rialto Bldg., San Francisco; Colman Bldg., Seattle; Paulsen Bldg., Spokane. | T-2 Tubular Woven Fabric Company.....
Pawtucket, R. I. |
| G-2 Great Western Securities Corporation.....
302-3-4 Hobart Bldg., San Francisco. | U-1 United Sheet Metal Works.....
575 Howard St., San Francisco. |
| H-1 Habirshaw Electric Cable Co., Inc.....
(See Western Electric Company.) | W-1 Wagner Electric Manufacturing Company..... 18
St. Louis, Mo. |
| H-2 Hemingray Glass Co..... 10
236-240 So. Los Angeles St., Los Angeles; 345 Oak St., Portland; 807 Mission St., San Francisco. | W-2 Western Electric Co..... 14
Eighth and Santee Sts., Los Angeles; 1900 Telegraph Ave., Oakland, Cal.; 680 Folsom St., San Francisco; 907 First Ave., Seattle; 45 North Fifth St., Portland, Ore. |
| H-3 Haller-Cunningham Electric Co.....
428 Market St., San Francisco. | W-3 Ward-Leonard Electric Co..... 22
Mt. Vernon, New York. |
| H-5 Hotpoint Electric Heating Co..... 1
Ontario, Cal. | W-4 Westinghouse Electric & Manufacturing Co..... 4-5-6
50-52 East Broadway, Butte; Van Nuys Bldg., Los Angeles; Couch Bldg., Portland; 212 So. W. Temple, Salt Lake City; First National Bank Bldg., San Francisco; Second and Cherry Sts., Seattle; Paulsen Bldg., Spokane. |
| H-4 Hubbard & Co..... 17
(See Pacific States Elec. Co.) | W-6 Westinghouse Lamp Co.....
(See Westinghouse Electric & Manufacturing Co.) |
| H-7 Hurley Machine Co..... 16
New York and Chicago. (See Pacific States Electric Co.) | W-8 Western Pipe & Steel Co.....
444 Market St., San Francisco; 1758 North Broadway, Los Angeles. |
| I-2 Illinois Electric Co.....
261-263 So. Los Angeles St., Los Angeles. | W-9 Weston Electrical Instrument Co..... 15
109 Weston Ave., Newark, N. J.; Frank E. Smith, 682 Mission St., San Francisco. |
| I-3 Interstate Electric Novelty Co.....
111 New Montgomery St., San Francisco. | Y-1 Youngstown Sheet & Tube Co.....
Youngstown, Ohio. |
| L-2 Locke Insulator Manufacturing Co..... 13
(See Pierson, Roeding & Co.) | |

JOURNAL OF ELECTRICITY

VOL. XXXIX NO. 2

SAN FRANCISCO, JULY 15, 1917

PER COPY, 25 CENTS



A Half Million Horsepower on the Columbia—a Typical Instance of Possible Power Development in the West

The West is Prepared—

With its ten million horsepower properly developed, the West could supply sufficient energy in A SINGLE DAY to transport the Kaiser and a thousand of his much vaunted Prussian leaders to the surface of the moon and still work with less than fifty per cent efficiency. It could then supply power to pump food, air and water to this place of isolation and yet reserve sufficient energy to drive the industrial wheels of an empire.

But coming back to earth—

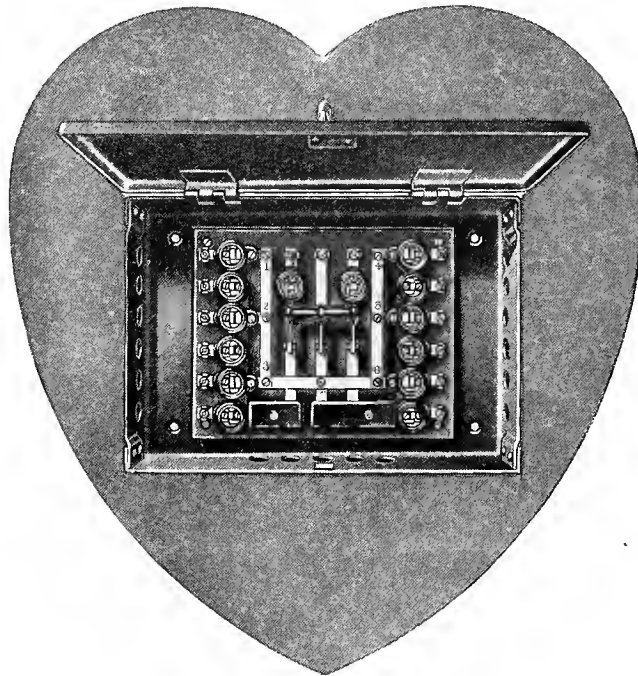
The eight states west of the Rocky Mountains as shown on the map herewith comprise nearly one-fourth of the total area of the United States, have but six per cent of the total population of the United States and yet they have developed more than one-third of the total hydroelectric power of the nation. Over two-thirds of a billion dollars have been invested here in central station construction and equipment. In no other section of the country is electric power available at lower rates or is it used more widely per capita of population. Ten million horsepower are today thwarted in development and are going to waste even though the industries of the nation are crying for conservation of fuel.

CAN'T YOU DO SOMETHING to urge upon Congress the necessity of reasonably encouraging the still further development of the splendid water powers of the West?



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Crouse-Hinds Residence Panels



Safety, Efficiency, Durability, Economy

For 1 or 2 Meter Connections and for
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Meter Loops can be sealed to prevent
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Same workmanship and materials which
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JOURNAL OF ELECTRICITY

Devoted to the Generation, Distribution and Utilization of Energy

VOLUME XXXIX

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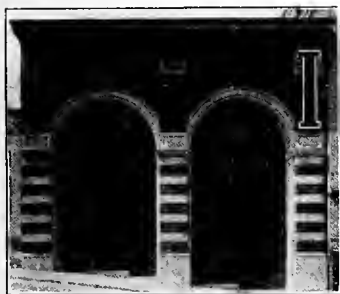
NUMBER 2

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A NEW ADVANCE IN FUEL OIL ECONOMY

BY C. D. STEWART

(New ideas in central station endeavor are constantly being put forth throughout the West that vastly forward the economic production of steam auxiliary electric power. Here is a description of a striking feature of the new Bush street station of the Great Western Power Company in San Francisco that should interest all those who have to do with the generation of steam by means of fuel oil. Economy in the use of fuel oil is of first importance in these days of national stress. As to how this is effected in this new installation by the careful automatic regulation of the oil, the ash pit opening and the damper control, the reader will find out in the following lines. The author is chief engineer for the company that has made the installation for the Great Western Power Company.—The Editor.)



The Bush Street Station of the Great Western Power Co

steam. Obviously the simplest method of taking care of this would be to maintain steam at full pressure in all boilers at all times. This, however, would not be the most economical. It remains therefore to devise some means for getting the generation of this steam under way in the shortest possible time when occasion demands.

This point seems to have been well provided for in the Bush street plant (San Francisco, Cal.) of the Great Western Power Company in the installation of an automatic oil stoking system that has proved itself to be reliable and exceedingly flexible during a period of a year's test conducted by this same company in one of its other plants.

N providing a steam stand-by plant for service on a hydroelectric line, one of the important points for consideration is reducing to a minimum the time interval for getting the steam generators on the line in the event of a partial or total interruption in the hydroelectric service. One of the prime factors in this is of course

The Bush street plant in addition to being a stand-by plant is also a low pressure central heating station, all steam to the heating system passing first through the generator turbines. The current generated, when not actually helping out in an emergency, is used for voltage regulation.

The boiler plant consists of six Stirling boilers having a total of 14 burners, two boilers being 275 h.p. each, and four boilers 350 h.p. each. The generating equipment consists of two 2500 kw. turbo-generators.

The principle of operation of the automatic oil stoking system installed is the control of the fires in a series of three steps, the apparatus embodying all the functions necessary to control the three elements of combustion in each step. These steps are designed



Fig. 1. The Interior of the New Power Plant, showing the Regulating Apparatus in Operation

nated pilot, intermediate and maximum fires. The pilot fire is manually controlled and set to take care of boiler radiation. The intermediate fire is automatically controlled and is set to take care of the

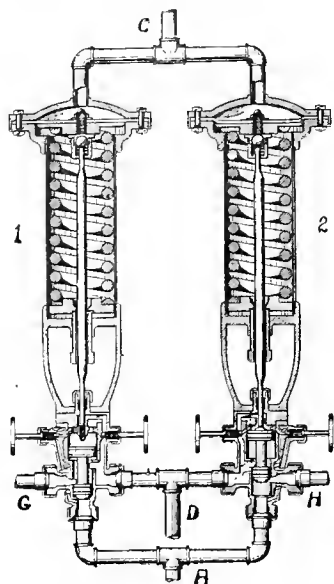


Fig. 2. The Master Controller

average load while the maximum fire, also automatically controlled, is set to take care of the maximum load of the plant.

The system is comprised of one master controller, 14 regulators, one for each burner, six interlocking damper devices, one for each boiler, and rods, levers, bell cranks, bearings and shafting as required for the operation of the ash pit and stack dampers.

The piping connecting these various devices and the oil and steam supply pipes to the burners are all overhead and are shown clearly in Fig. 1 running along the columns in front of the boilers. These pipes are named as follows: the main oil supply pipe connects the oil pump to the master controller reg-

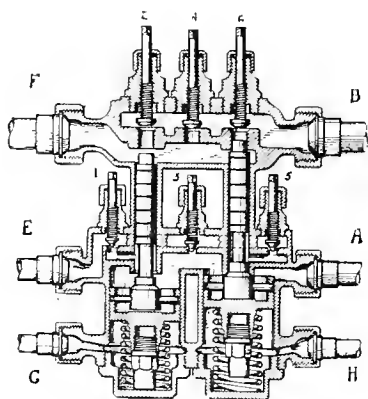


Fig. 3. The Automatic Regulator at the Burner

ulators and interlocking damper devices, this pipe is lettered A in Figs. 2 and 3, the atomizing steam supply pipe connects the steam main to the regulators, this pipe is lettered B in Fig. 3; the control steam pipe, connects the boilers to the master controller lettered C in Fig. 2; the oil return pipe connects the master controller and interlocking damper devices to the pump overflow pipe lettered D in Fig. 2; the burner oil pipe connects the regu-

lators to the burners lettered E in Fig. 3; the burner steam pipe connects the regulators to the burners, lettered F in Fig. 3; the medium fire control pipe connects the master controller to the interlocking damper devices and regulators lettered G in Figs. 2 and 3; the maximum fire control pipe connects the master controller to interlocking damper devices and regulators lettered H in Figs. 2 and 3.

In Fig. 4, may be seen the stoking system applied to a boiler. This view does not show an actual application of the apparatus to the power plant in question but is for illustrative purposes to show in one plan view the apparatus making up the stoking system and the location of the same in the piping just named.

Fig. 5 is an actual view of the interlocking damper device as applied on this installation and can be seen in place on the side of one of the boilers in Fig. 1.

The master controller consists of two portions called the intermediate and maximum fire portions. The interlocking damper devices are similarly divided while the regulators have in addition to these two parts a third called the pilot portion. As would be implied the intermediate portion (No. 1, Fig. 2) of the master controller governs the intermediate portion of the interlocking damper devices and the regulators. The maximum portion of the master controller governs the maximum portions of these devices.

The interlocking damper device interposed in the piping between the master controller and the regulators, interlocks the damper and regulator movements so as to insure that the damper openings are increased before the fires increase and that the fires decrease before the damper openings are decreased.

The adjustments of the apparatus are simple which consist in adjusting the various devices so as to give the desired fires in the several stages.

The master controller adjustment consists in setting the spring tension of the intermediate portion so that it will function at the maximum pressure carried on the boiler and the spring tension of the maximum portion so that it will function three to four pounds below this pressure.

The regulator adjustments consist in adjusting the size of the orifices through which flow the oil and steam in the pilot intermediate and maximum stages of the fire to the burner, the oil orifice being regulated by valves 1, 3 and 5, the steam orifices by valves 2, 4 and 6 in Fig. 3.

The interlocking damper device adjustments consist in placing the piston stops on the sprocket chain, Fig. 5, so as to limit the travel of both the intermediate and maximum pistons of this device to a distance that will give the proper damper movement according to the intensity of the 3 stages of the fires.

The equipment as installed in the Bush street plant is set to furnish steam at 200 lb. pressure. No. 1 portion of the master controller is therefore set to operate at 200 lb., the No. 2 portion at 197. In describing the operation of this equipment in the following it will be assumed that the regulators have been adjusted to admit the desired amount of oil and steam to the burners and the interlocking damper devices have been set to give the proper damper openings for these fires.

In each instance fuel oil is used as the power medium to operate the regulators and the interlocking damper devices as directed by the master controller and is always present in suitable chambers in all of these devices. Boiler steam pressure acting on the diaphragms in the chambers, at the top of the two portions of the master controller, in opposition to the springs underneath these diaphragms controls the flow of this oil in one direction or the other according as to whether the spring or steam pressure predominates. If the steam pressure predominates it is because this pressure has reached a point predetermined to be the limit with regard to the spring in question and oil pressure in that portion of the master controller is directed so as to decrease the intensity of the fires under the boilers retarding to that extent the increase in steam pressure. In case this was the maximum fire which was decreased the intermediate fire would still be burning, as the setting of the spring in the intermediate fire portion of the master controller is set for a steam pressure 3 pounds higher than that in the maximum fire portion. If this fire is sufficient to raise the steam pressure 3 pounds higher, the steam pressure acting on this diaphragm will be sufficient to overcome the spring tension beneath and this portion of the master controller will function so as to reduce all the fires to the pilot stage.

The pilot fires being sufficient only to take care of boiler radiation, the steam pressure will go no higher. If, however, an increased load causes a slight drop in steam pressure the spring in the intermediate portion of the master controller again predominates and this portion of the master controller functions so as to bring the fire back to the second or interme-

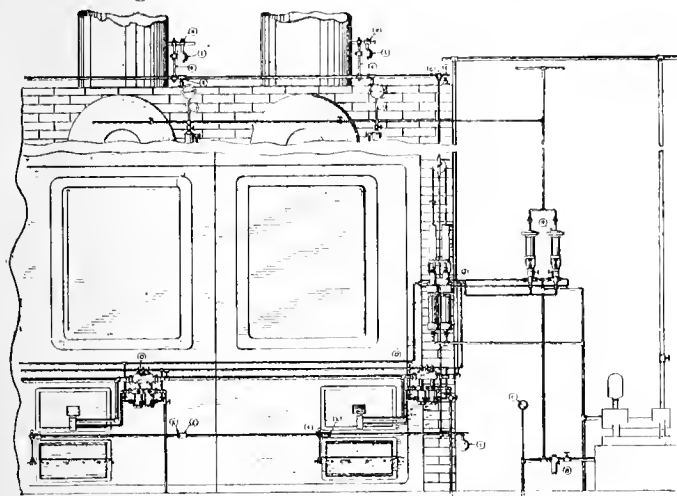


Fig. 4. Diagrammatic View, showing Manner of Control for the Oil, the Ashpit and the Damper

- | | | |
|------------------------|--------------------|------------------------|
| A. Master Controller | E. Single Bearings | I. Damper Weights |
| B. Double Oil Strainer | F. Damper Arms | J. Interlocking Damper |
| C. Oil Gauge | G. Clevises | K. Special Brackets |
| D. Regulator | H. Damper Hubs | |

diate step. A further drain on the steam pressure will eventually cause the maximum fire to come on.

Both the ash pit and stack dampers are opened by weights acting through suitable levers and not by oil pressure. This is a safety feature that will result in dampers opening in the event of any unusual action.

The master controller is equipped with manually operated valves which provide instantaneous hand very readily to a number of combinations of control control of the entire plant. The system lends itself

through the installation of valves and by-passes in the piping. As an example, should the conditions be such that three boilers would handle the normal load of the plant, three boilers can be cut in to work automatically between the pilot and medium fires, the others remaining on the pilot fires. Should an unexpected load, however, come on the maximum fires will automatically cut in on these boilers and both the intermediate and maximum fires will automatically cut in on the other boilers. This condition being brought about simply by operating certain globe valves in the piping. This illustration simply shows the flexibility of the system as it is actually installed. As to the efficiency of the plant, this follows naturally due to the fuel oil atomizing steam and air being controlled in a correct ratio in all stages of the fire. The maintenance of uniform steam pressure under extreme variations in load, the elimination of excess air and of the safety valve popping. In addition to economy there is another point of great importance. As this plant is located in the central part of town the elimination of smoke is compulsory, a condition that is realized through the use of the automatic stoker.

The installation has been made under the supervision of H. S. Markey, steam power plant engineer for the Great Western Power Company. The apparatus for regulating the fuel oil control is manufactured by the Westinghouse Pacific Coast Air Brake Company for the Associated Engineering & Supply Company of San Francisco, who act as distributors.

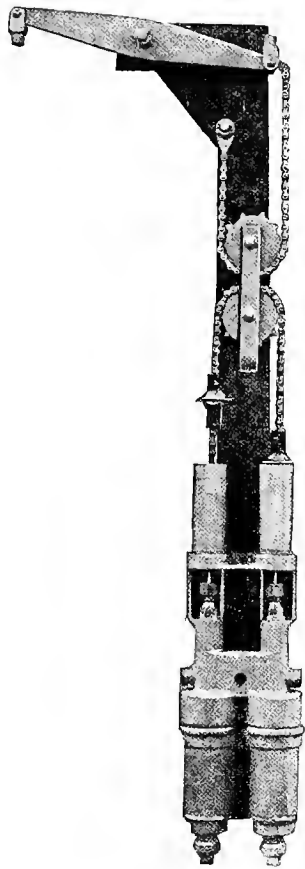
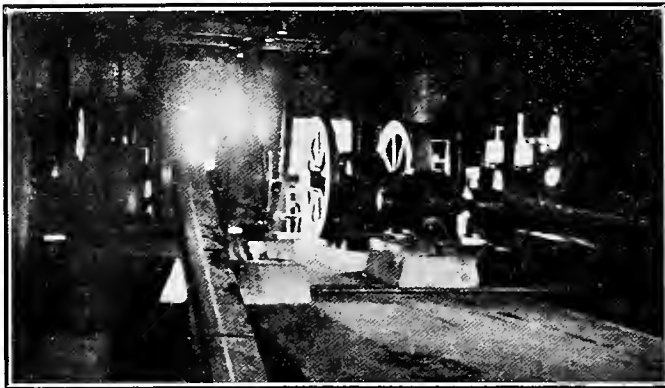
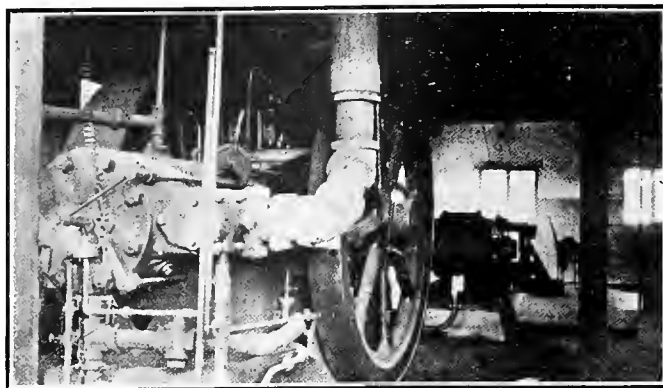


Fig. 5. The Regulator for the Damper Control

ELECTRIC ANNOUNCER USED AT DUTCH AUCTIONS

At the regular trade auctions held in the Netherlands instead of having an auctioneer call for bids there is a large dial provided with an index hand. The face of the dial is marked with prices, increasing in clockwise fashion. The hand is set at a price above that at which the goods offered will probably bring, then is slowly moved to lower and lower figures until some trader indicates his willingness to buy.

Electric push buttons are connected with the dial, which the traders press when a price satisfactory to them is shown by the dial. As the trader presses his button his number appears on the face of the dial and the lot of goods is sold to him at the price indicated by the index hand. There is no noise or confusion and the auctions are finished in a remarkably short space of time.



A STRIKING SCENE ON THE DESERT

Here is a scene typical of the advance of the hydro-electric utilization of energy in Southern California. In the first view, the gas engine for operating a pumping plant for irrigation is shown, while in the second view the small, compact electric motor service is exhibited replacing its giant competitor in the rear. Silent witnesses, such as these, encountered in ever-increasing numbers throughout the West, bear forceful testimony to the stately upward trend of the method electrical.

ELECTRIC PUMPING REPLACEMENTS OF GAS ENGINES

BY ROSS B. MATEER

(The gas-operated pumping plant as compared with the electrical unit is fast passing from usefulness in the highly developed hydroelectric districts of the West. Definite cost and operating data have long been lacking for comparative purposes. Here is an article by the commercial agent of the Southern Sierras Power Company which presents interesting and useful information on this question, as the illustrations are taken from recent replacements that have taken place in that territory.—The Editor.)

Intelligence, an asset to agricultural success was apparently seldom displayed in the early stages of agricultural development in Southern California, either in the cultivation of the soil or in the choice of a pumping plant.

It is at this time the value of an accurate, up-to-date card index is fully realized. Character of equipment, operating conditions and unit hour costs are readily obtained and a proposition based, not only on convenience but on plant efficiency and minimum operating expense is submitted to the prospective customer for his prompt acceptance. The electrification of the plant is discussed in clear, concise terms easily understood by a layman. Guarantees as to plant efficiency are conservative and backed up by the manufacturer. A reasonable time is allowed for the tearing out of the used apparatus and the installation of the "money saving" efficient equipment and the extension to the distribution system. Tests are conducted in the presence of the consumer, representatives of the machinery house and the central station. Satisfaction is apparent. An acceptance of the equipment is secured and all parties to the electrification have now not only a pleased customer but judiciously invested in good sensible and profitable advertising. Several of the many changes in plant equipment that have been effected to the welfare of consumer and utility are here cited and may prove of interest.

As the constant dripping of water will wear away a stone so will the activity of the conscientious utility salesman overcome the prejudice to electric service and educate the rancher to the many applications of electricity—its reliability, convenience and economy, as aptly illustrated by the experience of a local Mutual Water Company, which several years ago purchased and installed two sixty (60) horsepower engines to drive an eight (8) inch vertical and an eight (8) inch horizontal Byron Jackson pump for the irrigation of some six hundred (600) acres of citrus fruit land, and which only within the past year were displaced with electric service.

Comparison of Operating Charges

	Engine Operated 1915	Engine and Motor Operated 1916
Fixed Charges:		
Depreciation	\$ 655.79	\$ 500.00
Insurance (supervision 780)....	69.14	78.12
Expense (office 120).....	900.00	900.00
Repairs (engine)	619.78	700.12
Fuel	3,084.20	3,000.00
Total expense season	5,328.91	5,178.24
Inches water pumped	27,024.	26,205
Unit cost per inch.....	19.72c	19.08c

From the above it is evident that but for the item of \$700.12 repairs to engines—the early part of 1916, the unit cost per inch of water pumped for that season had not exceeded 17.07c—conclusive evidence, perhaps that gas oil as a fuel is rapidly giving place to fuel by wire.

Typical Instances of Gas Engine Replacements

	Before	No. 1	After	Before	No. 2	After	Before	No. 3	After
Motive power	40 h.p. engine	35 h.p. Westinghouse CCL motor	75 h.p. CW motor	25 h.p. GE motor	60 h.p. engine	2 West. CCI motors	1 GE 16 h.p.		
Pump	Air compressor	14 in. Layne Bowler	Air compressor	12 in. Krogh tur	3-14 in. Layne Bowler	3-14 in. pumps			
Static head	26 feet	26 feet	26 feet	26 feet	14 feet	14 feet			
Total Lift-Feet.....	50 feet	70 feet	68 feet	65 feet	59 feet	59 feet			
Water pumped (Gn).	88 inches	122 inches	65 inches	72 inches	117 inches	117 inches			
H.P. input.....		37.95	88	28.9		36			
Plant efficiency....		50%	11%	36.4%		43.2%			
Acreage irrigated...		50		200		225			

NOTES ON PUBLIC UTILITY RATES

BY C. E. GRUNSKY

(Vital to the public utility corporations is the method utilized in the regulation of rates. Here is an excellent contribution of papers on this subject by one of our best known engineers. In his final analysis the author adopts the Unlimited Life Method of procedure in order to eliminate accrued depreciation. This series of papers which will appear in several issues of the Journal of Electricity, coming as they do from one of our highest authorities, should bring out wide discussion from valuation engineers the country over.—The Editor.)

The writer has recently been asked to define his views on the rate regulation of public utilities with special reference to the earnings which should be allowed to the public utility corporation. In doing so he will, for convenience, refer to and quote in a limited measure from some of his publications on the subject of valuation for rate-fixing purposes and related matters.

For 25 years he has had to give more or less attention to rate regulation and his views on some of the more important features to be considered were definitely crystallized when as city engineer of San Francisco, 1900 to 1904, he made appraisals of the properties of the Spring Valley Water Company. He was from the outset so firmly convinced that accrued depreciation is not an element for consideration when rates are to be fixed that he has at all times adhered to this principle and in 1912 he contributed to the American Society of Civil Engineers¹ a paper on "The Appraisal of Public Service Properties as a Basis for the Regulation of Rates," to demonstrate its soundness. He found it desirable, for the benefit of the profession, to do this, because the rate regulating authorities were generally accepting without protest the view, laid down by the courts, that "value" must be the basis of the calculation when the sufficiency of a rate is in question. Concerning the above paper of 1912,—the theory laid down in which has gone unchallenged,—Mr. J. W. Alvord says²:

"The question of deducting depreciation from cost new, however, is fundamental to a proper value, and, as a matter of fact, for the past 15 years, engineers and attorneys have been arguing for its deduction, and courts have been approving the practice of subtracting the depreciation from reproduction cost new in every case brought before them, without a single exception which the writer can recall. Engineering appraisal boards, so far as the writer is aware, have pursued the same practices. In water-works appraisal, the question was discussed and settled more than 15 years ago, and has never been seriously controverted since, until Mr. Grunsky's paper * * * appeared in 1912, before this Society."

It is self evident that the service rendered by, or the output of any public utility does not deteriorate as the result of aging of the plant. If there is any change, the advantage should be with the long established plant which should render a more dependable and better service than a new plant. The value to the consumer of the service or of the output is in no way affected by the accruing depreciation. It is assumed of course that a well maintained plant is under consideration which shows no deferred maintenance.

The establishment of rates, therefore, should be independent of accrued depreciation. The rates found to be proper for a new plant should be equally appropriate for a plant which has been long in service. It

follows that some other procedure is desirable than the one which has apparently been laid down by the courts.

Furthermore, it is illogical to require that value in any form be made the starting point when rates or reasonable earnings are to be determined because value is a result of the earnings and can not be made a premise. The courts make inquiry relating to value because they are concerned in determining whether or not the earnings are adequate to protect the value. The rate-fixing authorities, on the other hand, are free to use any method that to them seems proper in determining the required earnings of any public utility. They need not apply the value test. They should, moreover, adopt the simplest and most direct method of procedure. This the writer has repeatedly pointed out, but finds it difficult to make plain to the old line economists and valuation experts, that as a starting point, despite the decisions of the courts, a rate-base can be used which is not value. Even Mr. Alvord assumes that the writer's appraisal of a rate-base undiminished by depreciation represents value. A clear distinction should be made between the writer's "natural rate-base" determined from legitimate investment, for example, and the "fair value" or "present value" which is so commonly used as the starting point. Although so-called "fair value" has been very generally used as a rating base, this does not mean that rate-base and value should be regarded as synonymous. The rate-base may be quite as distinct from value as original cost is distinct from value.

To make this clear it is necessary to keep in mind that the rate-base is any sum to which a rate of interest is applied in determining the interest increment which should be covered by the earnings.

For example in the case of a steamboat, whose owner may have made no other investment of capital than in the steamboat, the service rendered to those who ship freight on the boat or who travel on the same is worth no more nor less if rendered by a new boat, than if it were rendered by a boat which has already been in service one-half of its probable life term.

The natural rate-base in this case is the amount invested in a new steamboat or, expressed in the usual way, the legitimate investment, undiminished by depreciation. On this rate-base the owner will be entitled to interest at a fair rate covering at least the amount which a responsible owner would have to pay for borrowed money and he will also be entitled to such renewal or replacement increments as will, if held inviolable for this purpose, replace the steamer with a new one when it ceases to be useful. But if the owner were not allowed to earn more than these interest and replacement increments in addition to cost of operation, he would not be in the business. He is entitled also to a profit which while not exorbitant

¹Transactions Am. Soc. C. E. Vol. LXXV, p. 770.

²Transactions Am. Soc. C. E. Vol. LXXXIX, p. 232.

should yet be such in amount that this and similar enterprises will be encouraged and not discouraged.

The earnings required to meet interest and replacement apart from profit and operating expenses, would be estimated as below shown, if the interest rate to be allowed is 7 per cent and the steamboat which, new, had an expectancy of 20 years is now estimated to serve for 10 years longer:

For each \$100 of original investment in the steamboat:	
Interest on the rate-base 7 per cent on \$100.....	\$7.00
Replacement requirement, computed from probable life, 7 per cent	2.41
Total	\$9.41

To the allowances thus computed on the entire investment there are to be added the ordinary operating expenses and also profit.

If the practice of deducting accrued depreciation from the value of physical properties be followed the computation would be as follows (again without inclusion of the operating expenses and the profit allowance):

Original investment	\$100.00
Accrued depreciation when the remaining life of the steamboat is 10 years, interest 7 per cent.	33.70
Rate-base (so-called present value).....	\$ 66.30
Interest on the rate-base (present value of each \$100 of original investment) 7 per cent on \$66.30.....	4.64
Replacement requirement, being the amount to be earned annually to retire the so-called present value in the remaining years of the steamboat's life, (\$66.30 in ten years, 7 per cent interest).....	4.80
Total	\$ 9.41

In the one method of procedure a rate-base is used which may depart widely from the value of the steamboat, in the other method the depreciated value of the steamboat is introduced and this is made the rate-base.

In practice, however, to care for the profit element it has become customary to add to the present value of physical properties the value of certain intangible elements, so that in the great majority of utilities, made up of many items, the present value as used may be raised to or even beyond the natural rate-base determined from legitimate original investment undiminished by depreciation.

The aggregate value thus approximated may be a more or less arbitrary amount on which the rate of return is to be interest plus profit, or it may be the actual value which it is planned should result from a capitalization of net earnings at the interest rate at which money is obtainable for the type of utility under consideration, due regard being had to necessary discounts and commissions. If this interest rate is 7 per cent there would in the first case, a rate of return be allowed of perhaps 8 per cent or 9 per cent, of which 1 per cent or 2 per cent, as the case may be, would represent a profit in addition to the interest on that part of the intangible values known as "going value." In the second case the "going value" would be represented by the owners capitalized profit and the allowed rate of return would be not less than 7 per cent though possibly no more. Conversely, in this case, the interest on the intangible element "going value" would be the profit allowance.

The earnings of every public utility should be adequate

(a) To yield a proper interest return on the capital which has been legitimately invested in the enterprise;

(b) To renew essential items of the property when for any reason the items which have been in use must be abandoned;

(c) To meet operating expenses, including taxes, overhead, and all repair and maintenance requirements;

(d) To yield a profit, as compensation to the owner for management and hazards, and as a share in general prosperity;

(e) In exceptional cases to retire the invested capital in whole or in part when the life of the utility is limited;

(f) To amortize early losses or other legitimate sacrifices made by the owner and not proper for inclusion in the rate-base.

The legitimate original investment is not measured by original cost. This cost is to be taken into account, but, according to circumstances, remains subject to correction. The term investment as here used is understood to include actual cost of franchises and water-rights and strategic values of the same but not the intangible element of going value. The latter, as above stated, is the result of the profits of the business. Under certain circumstances the cost of reproduction, including an allowance for the cost of developing the business, will be the best guide in determining the legitimate investment, therefore, the natural rate-base.

The writer is not in accord with those who accept the principle laid down in the Knoxville Waterworks case by the Supreme Court of the United States,³ which says:

"A water plant, with all its additions, begins to depreciate in value from the moment of its use. Before coming to the question of profit at all the company is entitled to earn a sufficient sum annually to provide not only for current repairs, but for making good the depreciation and replacing the parts of the property when they come to the end of their life. The company is not bound to see its property gradually waste, without making provision out of earnings for its replacement. It is entitled to see, that from earnings the value of the property invested is kept unimpaired, so that, at the end of any given term of years the original investment remains as it was at the beginning. It is not only the right of the company to make such a provision, but it is its duty to its bond and stock holders, and, in the case of a public service corporation, at least, its plain duty to the public. If a different course were pursued, the only method of providing for replacement of property which has ceased to be useful would be the investment of new capital and the issue of new bonds or stocks. This course would lead to a constantly increasing variance between present value and bond and stock capitalization—a tendency which would inevitably lead to disaster either to the stockholders or to the public, or both. If, however, a company fails to perform this plain duty and to exact sufficient returns to keep the investment unimpaired, whether this is the result of unwarranted dividends upon over issues of securities, or of omission to exact proper prices for the output, the fault is its own. When, therefore, a public regulation of its prices comes under question, the true value of the property then employed for the purpose of earning a return cannot be enhanced by a consideration of the errors of management which have been committed in the past."

According to the view here expressed by the court every public utility should at once upon the beginning of operation earn enough, not alone to recover interest on its investment, but also to retire the va-

³212 U. S. Reports 1: 29 Sup. Ct. Rep. 148.

rious articles in use, each within its term of usefulness. This is manifestly impossible because in the great majority of cases the rate-payers will be few at the beginning of operation and it would be impracticable to exact from them rates that would produce earnings determined by such a requirement. There will be lean years, years during which additional sacrifice will be demanded from the owner. Such sacrifice he must make to establish his business on a paying basis. Consideration must be given to this situation and, in determining the legitimate investment, it is proper to include therein a fair amount for the cost of developing business.

To ignore past history of the utility and to assume that if the owner has not exacted an adequate return it is his own fault, appears to the writer unfair.

In connection with the decision of the U. S. Supreme Court in the Knoxville Water Co. case the writer makes the following comment in his book on "Valuation,"⁴ p. 135:

"Past history cannot be ignored if rates are to be so fixed as to be fair alike to the owner and to the rate-payer. In other words, not all shortage of earnings in the past is to be ascribed to errors of management. It is difficult to reconcile the language of the court with this principle even as it is difficult to understand why so many of the courts have held that value which results from earnings must be made the starting point when rates are to be fixed."

Sometimes, of course, the situation is presented of past earnings that were beyond all reason. The principle of "all the traffic will bear" may have been misapplied by the owner and it may be that not only what should have gone into a replacement fund, but more was actually collected from the rate-payers and that this excess as well as what should be in a replacement fund, was distributed as dividends, thereby leaving the property in an impaired condition. It is not to be understood from this statement, however, that profits, that is, earnings in excess of an allowable interest return, are in all cases to be construed as having been available for the retirement of capital or as a replacement fund. Even when there is some profit the utility might still fall short of fulfilling expectations, because both the original owner, and his successors, were and are entitled to more than a bare interest return on the sacrifice which they have made in establishing and maintaining the utility.

In the case of the complex long established corporation-owned utility, which is about to be brought under review for the purpose of having its rates regulated, the presumption should be that fair or even large profits in the past were legitimate and that having been absorbed in the dividend distributions to former stockholders, it would be unwise, as well as unfair to the present stockholders, to make the assumption that a part of these past earnings, usually taken as equal to the accrued depreciation, should all at once be deducted from original investment when setting a limit to the value which the earnings will be allowed to create. The unfairness or injustice of such a procedure has been generally recognized with the result that the allowance in the rate-base for intangible elements, particularly for "going value" is contended for by most valuation experts and is generally allowed.

although none but arbitrary methods of determining the amount thereof have as yet been suggested.

Ordinarily, therefore a procedure should be adopted based on the assumption that a utility, of the complex permanent character, has not retired any capital. Its earnings have been used to make repairs and replacements of abandoned property, keeping the utility at 100% efficiency, also, to pay interest and profit to the owners. The utility should be assumed to have been conducted exactly as would be expected if it had perpetual life. Some such assumption must be made as an aid in determining the treatment to which the utility is entitled when its rates are fixed for the future. If depreciated value of physical elements is made the starting point this could only be predicated on the assumption that to the extent of the accrued depreciation, capital has been retired out of earnings. But such an assumption is just, only in cases where the fact is obvious. Otherwise the proceeding should be to introduce into the calculation, a rate-base representing legitimate original investment, as already defined, undiminished by depreciation, and to allow in the earnings such a replacement increment as will make adequate provision for the renewal or replacement of each item of property as the same becomes useless and is abandoned.

But when a rate-base is thus determined and an interest return is applied to the same which will properly compensate the owner for the use of his money (due allowance being made for discounts and commissions) some provision must be made to give him, in addition thereto, compensation for management, and for hazards, and also to give him a share in the general prosperity of the community, because this prosperity must in part, be ascribed to the installation and operation of the utility. This reward, as already intimated, usually, though awkwardly, makes its appearance in the allowance for "going value" and in the appreciation of real estate and other properties where value increases with age, and also in a rate of return so fixed that it will exceed in some measure a bare interest return. By this addition to the interest rate the attempt is made to bring profit into some relation to the value of the utility. This does not work well because one utility may be of a type requiring a large investment to secure a given amount of revenue, while another may secure the same revenue on a trifling investment. There is, in other words, something else to be brought into the calculation besides a rate-base. The writer in "Valuation, Depreciation and the Rate-Base," p. 160 says:

"While it is important to establish a rate-base whenever rates are to be fixed, there may be cases in which other circumstances are of equal moment with the rate-base as a guide to the allowable earnings. It may happen that the public service requires only a small investment of capital compared with the volume of the business that is transacted, and it may then be more desirable and equitable to bring the compensation of the owner into some relation to the volume of business transacted rather than to the capital which is invested in the business.

"The case may readily be conceived of a concern such as an express company which rents its office facilities and operates under contract with railroad and steamship companies and which, outside of its trucks and other vehicles for the local distribution of the parcels entrusted to its care,

⁴"Valuation, Depreciation and the Rate-Base."

has made no investment of any moment. It would be vain in such a case to attempt a regulation of rates based solely upon a fair return upon the invested capital. The whole field must be brought into view. The volume of business transacted, and the value that would be created if earnings are allowed which exceed, in some definite fashion, the cost of conducting the business, should receive due consideration. If earnings are thus allowed which exceed the cost of operation by 10 to 15 per cent, this would not seem unreasonable unless the resulting rates are, in fact, more than the traffic can or should bear."

It need only be added that such a profit allowance as here suggested might well be graduated according to the gross annual income, making the allowance larger, perhaps 15 per cent for the smaller concern and dropping materially below 10 per cent when earnings of \$10,000,000 to \$100,000,000 per annum and more are under consideration.

There will, however, be special cases when even such profit allowances as here suggested will be, at least temporarily, inadequate. Let it be supposed for example that the owner of the utility has made an invention or can secure the right to use an invention, by the introduction of which he can materially reduce the cost of operation, but that the introduction of the invention involves the abandonment of property which would, except for the innovation, have remained long in service. Under any hard and fast rule that no property value shall be included in the rate-base except it be in use, there would be a sacrifice by the owner represented by the former value of the discarded property. Furthermore, cost of operation being taken into account and this cost being reduced, there would be good ground for a corresponding reduction of rates. If such a reduction be made to the full extent of the reduction in operating expenses, the entire benefit of the invention would go to the rate-payer and the owner might find himself penalized to the extent of the value of the abandoned property. The proper proceeding in such a case is to allow to the owner the benefit resulting from the reduction of operating cost, for a certain time, long enough at least, to let the benefit amortize or retire the investment in so much of the property as is rendered useless, the owner finds it to his advantage to lower his prices for the purpose of increasing his business and thereby augmenting his net earnings, and thereafter, to divide the benefit between the owner and the rate-payer on a mutually advantageous basis, which will be done by introducing a larger profit allowance into the calculation than would be there under ordinary circumstance, and yet not so large as to deprive the rate-payer of some share in the benefit which has resulted from the use of the invention.

There is yet another question that arises whenever the amount of allowable earnings is to be determined for a public utility. This relates to the allowance which should be made for replacement or renewal requirements, or, as some valuation experts would say, for "current depreciation." If the property is all new and if conditions are such that any earnings determined to be reasonable and proper will actually materialize in the income from the beginning of operation, then it will be proper to proceed according to sinking fund methods using the same rate of interest as is applied to the rate-base. The replacement incre-

ments must then be placed in a fund, or will at least appear on the books to be in a fund, and the earnings of this fund must be held inviolable for use in supplementing the annual replacement increments. The fund's earnings, plus these increments, if assumptions as to probable life of the items of the plant have been correct, will be just sufficient to make renewals as these may be required.

As an alternative to this method of procedure the practice may be followed,—a new plant being again under consideration—of allowing the actual replacement requirements from year to year,—nothing the first year, a small amount the second year and increasing amounts thereafter until a time is reached when the replacement requirements will be approximately those estimated by the straight line method. This method has the advantage of simplicity. It is the method adopted on public works, such as streets sewers, public buildings, harbors and generally all public non-revenue producing properties. It is the common sense method.

Under neither of these methods, if properly applied, and if the replacement fund is actually created in proper amount out of earnings, will there have been any retirement of capital. The rate-base in each case will be original investment undiminished by accrued depreciation.

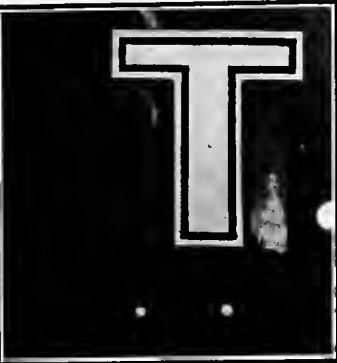
When the utility to be brought under regulation is no longer new; when it represents a plant which has seen long service, but which is at full efficiency when gauged by its own standard and falls into that class for which it should be assumed that past earnings have not retired any of the investment, the first inquiry will be as to whether or not there has been established out of earnings any replacements fund. If there be none, then the actual current replacement requirement will be the proper allowance. This will have to be estimated perhaps by the straight line method, corrected by practical experience. If the estimate be at fault no harm will be done as there will be a separate accounting for the money which goes into the fund and if the same is either depleted or grows too fast, suitable correction can readily be made in the future replacement allowances. When there is a fund, the earnings of which are retained therein, then the fund earnings will reduce the replacement increment which is to be collected from the rate-payer.

It will be seen from the foregoing that the vast amount of work which has been done in recent years to ascertain accrued depreciation as an element for consideration in regulating the rates of railroads and other public utilities is wasted energy. The requirement apparently laid down by the courts that value must be made a starting point has led experts and valuation commissions to seek new meanings in the word value. The writer hopes that some day the supreme court will so interpret or modify its Knoxville decision that the public service commission will feel free to cut loose from value when fixing upon a rate-base. He has faith in the valuation experts and economists but believes that they should press with greater vigor the demand for a simplified procedure. It is their duty to enlighten the courts. They should have the courage to point out any correct proceeding even though in conflict, at least apparently so, with

the decisions of the courts, because any conclusion of the court as expressed in the Knoxville decision remains binding only until the same has been modified by a later finding of the same high authority. Until this is done, however, the valuation engineer will find it advisable to comply with the requirements of the public service commissions, and to struggle with "present" and "market value" and let the commissions and the courts make the most of a bad situation. Now and then he may find a court which is bold enough to say that accrued depreciation may be ignored as in Idaho where, in the Pocatello Water Company case the Supreme Court of the state recently, said:

"So far as the question of depreciation is concerned, we think deduction should be made only for actual tangible depreciation and not for theoretical depreciation, sometimes called 'accrued depreciation.' In other words, if it be demonstrated that the plant is in good operating condition and giving as good service as a new plant, then the question of depreciation may be entirely disregarded."

NIGHT VIEWS
BY C. B. MERRICK



Lafayette and the Rotunda

THE Panama-Pacific International Exposition afforded an unusual opportunity for taking night views because of the type of illumination used. The indirect lighting effects approximated daylight to the extent that admirable night scenes were at the disposal of the photographer, contrasting strongly with the former possibilities when outline illumination was in vogue.

Figs. 1, 2 and 3 show the excellent lighting effects which can be obtained by time exposures, especially Fig. 2, which illustrates the spectacular side of this intensely interesting pastime. Anyone who saw the steam and fireworks display will readily recall Fig. 3. The insert shows some of the first loops made at the Exposition by Art Smith, photographed from a house top, 9000 ft. distant.

In night work it is important to avoid any moving lights which might streak the film. This can be done by closing the shutter until the light has passed.

The speed film of today has a ratio of sensitiveness of approximately 100 to 1. Consequently, two objects, one a hundred times as brilliantly illuminated as the other can be photographed together and the film will correctly record the contrast between the two. Since the variation of illumination for an average landscape is not more than 50 to 1, the photographer can underexpose the dark object, or overexpose the bright object one hundred per cent and still obtain a correct degree of contrast,



The Exposition Fireworks, Two and One-half Minute Exposure

Average Exposures
(8 ft. candle minutes stop 16)

	Stop	Time
Indirect illumination	16	5 min.
Silhouette of outline illumination.....	16	6 secs.
Moonlight views (full moon)	8	1 hr.

SAFETY SUGGESTIONS FOR ELECTRIC APPLIANCES

When through using an electrical appliance, turn off the current and pull out the plug. Safe and economic.

Never leave a heated iron. If called away, first turn off current—you may be detained.

Never rest iron on cloth or wood. Use metal stand.

When using hollow-ware utensils, such as percolators, chafing dishes, see that they contain water when current is turned on. Never let them cook dry.

Don't overload a circuit by using several appliances at one time.

If the flexible cord—which should be kept dry and free from knots and twists—shows signs of wear have it repaired.

If a fuse "blows" notify your electric company. Don't experiment.

The motor on a fan, vacuum cleaner, washing machine, etc., should be occasionally oiled. If it becomes so hot that it cannot be touched with comfort, turn off current and notify your dealer or electric company.

Do not attempt to install or extend existing wiring or make repairs. Such work should be done by an experienced electrician.

AN ELECTRICAL METEOROLOGICAL STATION

The second meteorological station in the United States for the gathering of data of the upper air will shortly be erected in Hawaii unless the plans of the army and of the weather bureau go askew. By a proposal presented by the local representative



Art Smith Looping the Loop at Night, Nine Thousand Feet Away

of the weather bureau, A. M. Hamrick, and enthusiastically endorsed by the army authorities of this department, an electric-reel station from which will be flown the great kites which carry the instruments aloft is planned to be placed here as soon as practical.

BEARING CURRENTS IN A ROTARY CONVERTER

BY L. J. CORBETT

(Bearing currents in a rotary converter and the consequent excessive pitting and scarring caused by these currents at starting is a subject of timely interest throughout the West, where inventories are being taken to increase outputs of installed apparatus to meet the gigantic industrial strains now encountered in central station practice of the West. The author is professor of electrical engineering at the University of Idaho and a well-known investigator on electric pumping and irrigation in the Northwest. —The Editor.)

In one of the shops of the University of Idaho is a rotary converter used to supply direct current to a number of shop motors from the three-phase mains of the power company. The attention of the writer was called to it some months ago, as it sparked badly at the end of the shaft when starting, (from the a.c. end), and in addition it had become very difficult to start in this manner, too frequently tripping the automatic oil switch and thus cutting off the shop power. It was evident that the trouble was due to bearing currents and their effect upon the shaft and

The winding upon the armature is an ordinary polyphase converter winding with taps and rings for one-phase, two-phase, three-phase and six-phase operation. It had been relegated, of late years, to use as a three-phase converter in regular service, though formerly intended as a special machine for laboratory purposes. When the starting switch is closed, connecting the armature to the three-phase line through resistances, a rotating magnetic field is induced as in the case of the induction motor, which travels around outside of the armature. Copper grids inserted in the

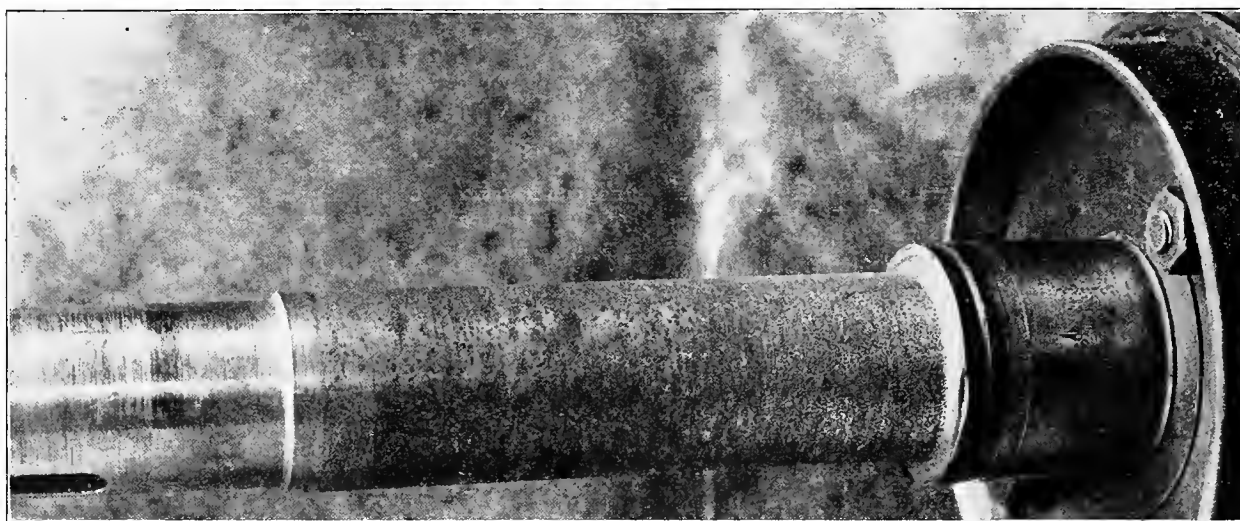


Fig. 1. Shaft, showing Excessive Pitting and Scarring Caused by Bearing Currents at Starting

As the primary field rotates about the armature when the armature is first energized, the rotating field becomes exceptionally strong at the instants when its poles coincide with the stationary poles of the frame. When it leaves this position the reluctance is increased and the magnetism lessened. Such action as this causes bearing currents that bring about the excessive pitting indicated in the illustration.

babbitt linings, so these features were investigated at once.

Fig. 1 is from a photograph of one end of the shaft at the position of the bearing and shows the excessive pitting and scarring caused by the bearing currents at starting. Some of this is due to the popping sparks noted at or before the armature commences to revolve; the balance to silent electrolysis after the armature has gained headway and before the field is energized.

The converter is started from the a.c. and by connecting to the three-phase line with resistance in two of the leads. After the armature has come up to synchronous speed the switch is thrown to the running position in which these resistances are cut out of the circuit, after which the field switch is closed.

Fig. 2 shows an end view and Fig. 3 a side view in outline of the converter, and the following explanation of the generation of these harmful currents is offered.

pole faces act in the same manner as the bars on the rotor of a squirrel cage induction motor, the reaction of the magnetic fields of the primary currents and induced currents causing the armature to turn.

As the primary field rotates about the armature when the armature is first energized, the rotating field becomes exceptionally strong at the instants when its poles coincide with the stationary poles of the frame. When it leaves this position the reluctance is increased and the magnetism lessened; it is decreased again and the magnetism increased as the poles of the rotating field come into coincidence with the field poles again a half cycle ahead.

The magnetism in the frame has been reversed during this half cycle. If in Fig. 2 the field poles, when serving only as portions of the magnetic circuit for the rotating field, are as indicated at a given instant, a half cycle later they will be of the opposite polarity. The fluxes $\phi_1, \phi_2, \phi_3, \phi_4$ will be alternating. All of them will be cut by the metal of the armature

and shaft, which may be considered as one conductor, and also by the frame and field poles, which may be considered as another conductor. If the frame and field poles were symmetrical, the fluxes would be equal and balanced, but this condition is not realized, so there will be a preponderance of magnetic flux cut by the rotating conductor first in one direction and then in the other.

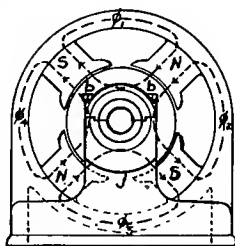


Fig. 2. Field Poles, showing Portions of Magnetic Circuit for Rotating Field

This generates an alternating e.m.f. in the shaft system which sends a current through a shaft and frame by way of the bearings as indicated in Fig. 3.

At the time of starting, the rotating field travels around the armature at 1800 r.p.m. When the converter armature has reached synchronous speed this field is stationary in space, as the poles of the rotating field coincide with the actual field poles as in

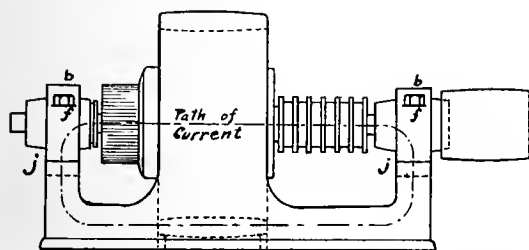


Fig. 3. Typical Currents Through Frame and Shaft

a synchronous motor. Under these conditions there will be no appreciable current flowing in the shaft.

The remedy adopted in this case was the thorough insulation of the joints in the frame directly below the bearings. A layer of empire cloth at the joint (j) and a wrapping of the bolts (b b) with the same material with fiber washers at (f f) sufficed for this purpose and there has been no further trouble from this source.

WIRELESS TELEPHONE WILL BE USED BY THE NAVY IN WAR

Wireless telephony as well as wireless telegraphy will be used by the United States Navy in its war operations. A year ago, by order of Secretary of the Navy Daniels, telephone officials of the Bell system and Navy officers planned and successfully carried out a three-day mobilization of communication forces during which war conditions were simulated. Instantaneous communication was provided over the wires of the Bell system by both telephone and telegraph from the office of the Secretary at Washington to all the naval stations in the continental United States, and wireless telephone communication was maintained between the office of the Secretary and an American battleship in the Atlantic Ocean.

Since that time engineers and scientists connected with the Bell system have been working in close co-operation with officials of the Navy Department and have developed further the use of the wireless telephone in the naval service. The plans followed in the original mobilization have proven in practical operation to be as highly satisfactory as they were at that time.

The telephone and telegraph engineers, whose organizations are all represented on the telegraph and telephone committee of the Council of National Defense, have also been working with the Army and naval officials, the National Research Council and the Naval Consulting Board on many research problems of vital importance to national defense, such as telephone communication with airplanes, new wireless methods, and apparatus for detecting the presence of submarines, and important progress has been made.

A MAMMOTH OFFICE SWITCHBOARD

When the Southern Pacific Company's new building at Stuart, Market and Spear streets is completed in November of this year, it will boast of the very latest type of eight position telephone switchboard, which is now being constructed for the company at the Western Electric factory at Hawthorne, Ill. This will be one of the largest—if not the largest—private branch switchboards on the Pacific Coast and will permit of additional sections being added from time to time as the company may require. In addition to this, the chief operator will be provided with a supervisory position from which she can supervise the service, both incoming and outgoing, from her desk, and take care of any overflow that the regular switchboard is unable to handle expeditiously.

In the new building there is to be a switchboard with a maximum of eighty lines and more modern than the one now in use, to take care of the company's exclusive service. These modern switchboards are being installed primarily to attend to the public wants.

The telephone in the new Southern Pacific building is being arranged with a view to affording the operators plenty of light and air. The telegraph office will be equipped with the latest type of telegraph apparatus, repeater tables, test panels, and will be arranged with a view to increasing the efficiency of the telegraph department.

VOLUME OF CALIFORNIA RIVERS MEASURED

Throughout the Sacramento and San Joaquin valleys water has relatively large value for irrigation, and the enormous importance of California water powers is now generally recognized.

Water-Supply Paper 391, "Surface Water Supply of the Pacific Slope Basins in California," will be useful to engineers and others interested in the utilization of the streams in that region, although it is too technical to be of value to the general reader. Copies may be obtained without charge by applying to the Director, United States Geological Survey, Washington, D. C.

"DOING-IT-ELECTRICALLY" IN THE SCHOOLS

BY HOYT CATLIN

(Here is a brilliant idea that will serve to indelibly impress upon the children of the schools the wholesome uses to which electricity may be put. In this electric soup-cooker, a cheap and healthgiving beverage is provided electrically for each child at the nominal price of a cent and a half and the older children are given an opportunity to use their ingenuity in construction and operation of the device, thus clinching for all time their interest and knowledge in the fundamentals of the art. Plans and pictures are shown herewith so that central station managers and commercial agents generally can pass the idea along to the various communities served throughout the West. The idea originated with the author who is connected with the staff of the Pacific Power & Light Company, and with F. G. Weller who is principal of the Nob Hill School at North Yakima, Wash.—The Editor.)

The Nob Hill School in North Yakima equipped its domestic science department entirely with electric equipment during the past summer. After trying it for a month or so during the fall term, this department found electricity so satisfactory and the cost of operation so reasonable that the Pacific Power & Light Company was asked for information upon the subject of preparing electrically the noonday hot lunches.

We found that during the previous term the school had prepared about five gallons of hot soup or cocoa per day. This had been served to the eighty pupils at a cost of one cent per cup. Not all of the children purchased the hot soup regularly.

The attention given by the teacher of domestic science to the operation of the disagreeable oil stoves occupied so much of her time that she could not give the food the care it required. At the beginning of this past fall term the officials of the school were quite dubious as to the prospects for a satisfactory hot lunch service for the coming winter. To prepare the large quantities of liquid required upon the surface burners of any ordinary electric range would have been a slow and expensive process. We recommended that we be allowed to make for the school a special soup cooker of eight gallons capacity. After some delay, the cooker was constructed and installed.

As the accompanying pictures illustrate, this cooker was made by placing a heavy sheet metal lining inside a wooden cabinet, this lining supporting the electric heater and the seamless granite stock ket-

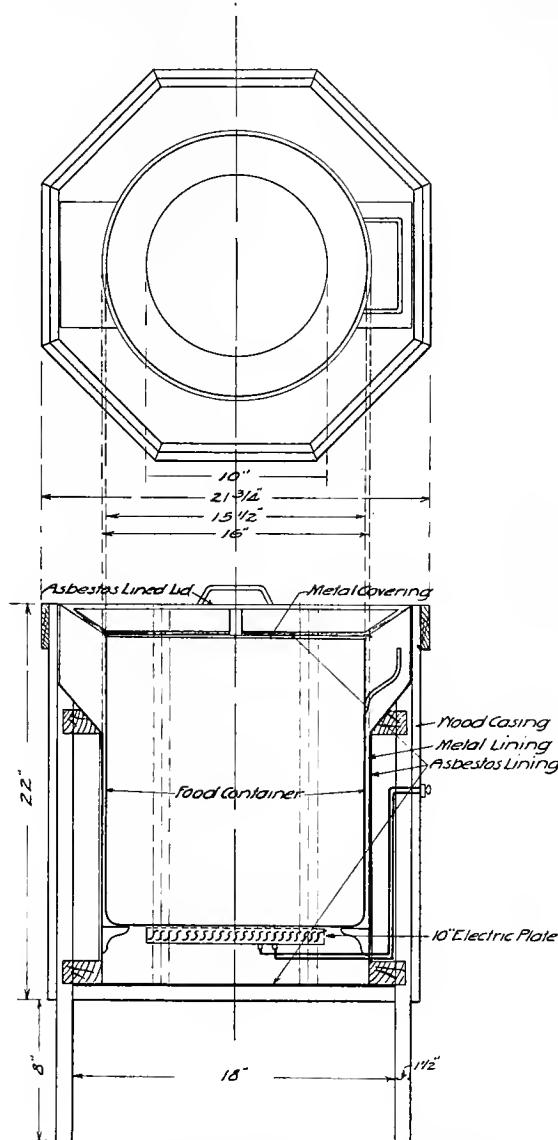
tle for the soup. Three inches of air space was left between the lining and cabinet. The kettle is supported independently of the heater, by lugs riveted to the inside of the lining. The 2000-watt, three-heat Westinghouse 10 in. heater disk is supported by four light frames which hold it so that it is in light contact with the bottom of the stock pot when it is in place. A three-way switch controlling the heater disk is fastened to

the outside of the cabinet and a Hubbell receptacle placed alongside it for connection to the power circuit through a flexible cord. Two inches of asbestos boardware was placed in the bottom of the lining to prevent escape of heat downward and to eliminate the danger of charring the wood of the cabinet.

The heater disk is not connected as it is in the Westinghouse range. On full heat, the whole surface of the heater is active. On medium heat the 4 in. center is cut out. On low heat, only the middle two-ring section burns. This system is used to prevent burning of foods which would normally be over the intensely hot center. This idea has worked out perfectly in practice as no food has ever been burned in this soup cooker.

The cost of this heater complete was about twenty-five dollars.

To pay for the heater in two years and to cover all costs of making the soup—materials, electricity, etc.—the cost of the service was raised to 1½ cents a cup. This permits the school to supply a very pleasing quality of soup, the expenditures for soup making materials



DETAIL DESIGN FOR ELECTRIC COOKER

Here is a complete design for an electric soup cooker that has proved economic and effective in serving hot soup to the school children at North Yakima, Wash. Its design is so simple, its economic features so pronounced, and its possibilities of educating the young in the uses of electricity so marked, that its use is highly recommended for other districts throughout the West.

being almost doubled over the preceding year. The attention given the cooking of the soup is almost nothing. The children take turns in serving it and washing the dishes. Practically every pupil in the school has purchased the soup every day during the



Electric Soup Cooker Ready for Work

past season. The school board, the teaching staff and the children themselves are all enthusiastic over the system.

It is the intention of Mr. Weller, the principal, to utilize this cooker in the Mother and Daughter clubs this summer for the preparation of fruits and vegetables for canning. Inasmuch as it has cost the



Two Views of the Cooker

school but two dollars per month to operate it for the soup cooking, the ones in charge are confident that they have solved the problem of heat for canning operations. We are watching this apparatus with much interest.

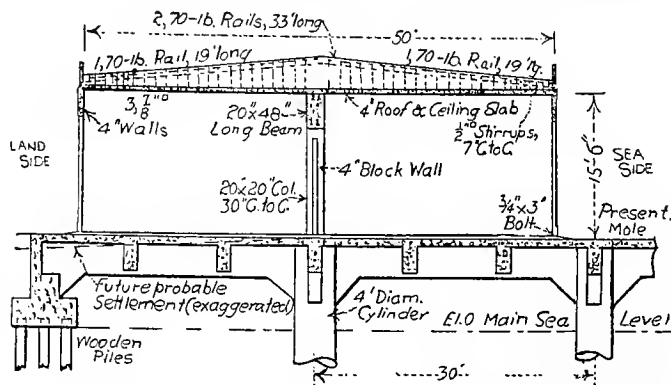
GIGANTIC ELECTRICAL EQUIPMENT FOR CANTONMENTS

Estimates of the total requirements of electrical equipment for the sixteen military cities amounts to 20,800,000 ft. of insulated wire, 260,000 ft. of lamp cord, 125,000 key sockets, and about the same number of shades, 150,000 cleat receptacles, 22,000 snap switches, 27,800 combined switches and plug cut-outs, 75,000 plug fuses, 3,000,000 pairs of unglazed porcelain tubes; about 7,000,000 $1\frac{1}{4}$ to $2\frac{1}{4}$ in. wood screws, 9600 lb. of friction tape, 4000 lb. of solder, and other items on a similar scale.

THE ELECTRIC CHARGING STATION AT CRISTOBAL TERMINAL

In view of the increasing uses of electricity in the West for the operation of electric trucks, the following design of a charging station in the Canal Zone should prove interesting:

The building for the repair shop and electric charging station for the electric trucks employed at the docks at Cristobal has been completed, and pending the arrival and installation of the electrical equipment,



Design of Electrical Charging Station on the Canal Zone

placed in service temporarily as a loft and storage house.

The building is at the head of the slip between Piers 8 and 9, on the concrete paving on the mole, back of the landing wharf for small boats, and its location is responsible for a construction which is a novelty on the Isthmus. The weight of the building is carried on a row of columns extending along the longitudinal axis, and these columns are supported on the steel and concrete caissons on which rests the paving at the head of the slip. On the side next the land the paving is supported on timber piles which have settled slightly. In order to assure the charging station against settlement it was constructed with a continuous reinforced concrete beam which extends the length of the building on the center columns and from which the side walls are literally suspended by means of cantilever beams set at intervals of 10 ft. The walls are only four inches thick. The wall on the sea side is made fast to the paving by means of anchor bolts.

The building is 271 ft. 8 in. long by 51 ft. 4 in. wide and one story high.

ELECTRIFICATION OF SWISS FEDERAL RAILWAYS

The electrification of the Swiss Federal railways, which for 15 years has been strongly advocated throughout the country, but has met with serious obstacles during the war, has now emerged as a very practical economic question. In developing the plans for electrification, the government has created a special department, attached to the Direction of the Swiss Federal Railways, known as "Direktion für die Einführung der elektrischen Zugförderung der Schweizerischen Bundesbahnen, Berne, Switzerland."

This department announces that it is prepared to consider proposals for sale and delivery of such electrical material as may be necessary for equipment in connection with this work, and that bids will be received from all countries.

THE SELECTION OF HEAT INSULATING MATERIALS

BY JOHN CRAWFORD, JR.

(Efficient insulating materials are daily helping to solve the ever important problem of economic heating of water by electricity. Here is a treatise on this subject that will prove of immense assistance to our readers throughout the West, as it comes from a well-known authority on this particular line of discussion. The author is manager of the asbestos and magnesia department of the San Francisco branch of H. W. Johns-Manville Co. A synopsis of this paper was delivered before the Riverside Convention of the Pacific Coast Section N. E. L. A.—The Editor.)

In view of the fact that there are few items of mechanical equipment that will show such a high return on investment and which bear such a low yearly charge for maintenance and repairs as heat insulation, it is rather surprising that the engineering profession, generally, has given this subject so little serious study.

The reason for this to a large extent has been the lack of authentic and impartial data on the heat losses from bare surfaces and the saving to be effected by

various types of heat insulation. Within the past few years, however, the research laboratories of our universities; the United States Bureau of Standards, and private corporations, have contributed much very valuable data on the subject of practical heat insulation.

With this information available, there is no longer any reason why the engineer should not give the same careful consideration in selecting the proper type and thickness of insulation to give the highest permanent return on investment in terms of fuel saved and increased operating efficiency which he uses in specifying any other mechanical equipment.

In order to appreciate why one type of insulation is preferable to another for any particular condition of service, it is necessary to have a clear conception as to what heat is and the modes by which it travels.

Heat is the phenomenon resulting from the vibration of the molecules composing matter. The extent of sensible heat in a substance—or its temperature—increases the rapidity of this molecular vibration. So far as this earth is concerned, temperature may be said to range from minus 460° F. (absolute

zero), at which point the molecules in matter are without movement, to 9608° F., the temperature of the sun, where rapidity of molecular vibration is very high, though the temperature of one of the stars in the constellation of Taurus is 27,000° F. The highest available temperature we have, practically, is the electric arc which is 6500° F.

The progress of heat from a higher temperature to a lower temperature in the same solid, homogeneous body is called heat conduction. This heat transfer is effected by the gradual communication of the more rapid molecular vibrations at the hotter points—molecule by molecule—to the cooler points. When the speed of vibrations is equalized at all points, heat flow ceases.

The time required for heat to be conducted from one point to another point in the same substance—i. e. for the molecules vibrating most rapidly to communicate the speed of their vibrations to adjacent molecules—varies with each substance. At one end of the scale we have a perfect vacuum, which cannot conduct heat (since no matter is present) and at the other, silver, which is the most rapid known conductor of heat.

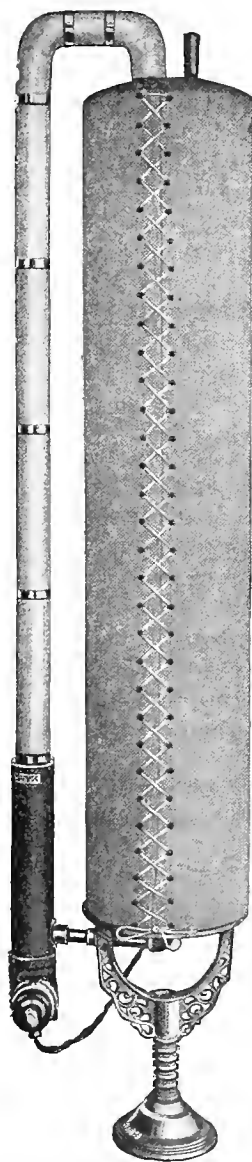
Of all practical substances air is the poorest conductor of heat and—as will be brought out later in this paper—this fact is taken advantage of in the manufacture of all thermal non-conducting materials.

In mobile bodies, such as liquids and gases, the ability of the body to move within itself assists in the transfer of heat by what are known as convection currents. All liquids and gases expand as their temperature rises—i. e. their weight per unit volume decreases. Hence, if we communicate heat to the lower stratas of a mobile body—air for example—a local portion of the air at the bottom expands and becomes lighter than the cooler air above and around it. The lighter air will rise and the cooler air will sink and take its place. Thus a circulation is induced which brings the warmer and cooler portions of the air in intimate contact until the temperature of the entire mass has become equalized.

Thus, it is apparent, that although air—per se—is the slowest conductor of heat, its mobility makes these convection currents possible. Hence, the coolest portions of the air will be brought in direct contact with the hottest portions of the air and the whole will attain a uniform temperature quite rapidly. The velocity of these convection currents—or the rapidity of this communication of heat from the hotter portions of the air to the cooler portions—increases very rapidly as the difference in temperature between them becomes greater.

It is generally supposed that the velocity of these convection currents varies in an increasing geometrical ratio with the difference in temperature between the hottest and coldest stratas of air.

One of the greatest functions which thermal non-conducting materials have to perform, is to reduce to a minimum the loss of heat by convection currents of



Boiler and Piping Insulated for Electric Water Heating

zero), at which point the molecules in matter are without movement, to 9608° F., the temperature of the sun, where rapidity of molecular vibration is very high, though the temperature of one of the stars in the con-

air, either through the non-conducting materials themselves or between them and the surface they are designed to insulate. Hence, in selecting non-conducting materials, one should consider carefully as to whether their nature and design is such as to give assurance that they will permanently reduce heat losses by convection to a minimum.

Thus far, we have only considered the travel of heat in homogeneous bodies, but of the greatest importance is the law governing the transfer of heat from one body to another—heat moves from a warmer body to a cooler one by what is termed radiation.

In order to explain the transfer of heat by radiation, we must accept the theory that the entire universe, including all space (even the perfect vacuum) and the interstitial spaces between the molecules in all forms of matter, is permeated by a medium of infinite tenuity—i.e. having neither weight nor volume—which is termed luminiferous ether. This ether is susceptible to the molecular vibrations in matter which cause similar vibrations to be set up in it. We may conceive these ether vibrations to carry heat in a manner analogous to the mode of travel of light by light waves.

The rapidity of these ether vibrations varies as the difference of the fourth powers of the absolute temperatures of the hot body and the cooler one to which they are traveling. Just how significant this fact is may be well illustrated by the fact that if one stands in direct sunlight on a cold winter's day, he may perspire—though the temperature of the air be below zero—but if the sun is obscured by a cloud, he almost instantly feels cold. We know that the sun is 94,000,000 miles away and even light waves, traveling 186,427 miles per second, require about 8 minutes to progress from the sun to the earth. Hence, the speed which these vibrations attain, due to the enormous temperature difference between the sun and the earth, to reach the earth almost instantly, is beyond our conception.

Whereas heat lost by radiation through the walls of cold storage rooms is insignificant because of the relatively slight temperature difference between the air inside and outside, as this temperature difference increases in low pressure steam, high pressure steam, and superheated steam, so does the consideration of heat transferred by radiation become correspondingly of more importance.

Radiant heat is almost entirely absorbed by some substances, almost entirely reflected by other substances and neither reflected nor absorbed by other substances, but almost entirely transmitted. The ability of a body to reflect, absorb, or transmit radiant heat varies with its chemical composition, the diversity of its molecular arrangement, its physical structure and the nature and color of its surface. In a restricted sense, we may say that those substances which are capable of conducting heat most rapidly will radiate, or conversely, will absorb it most slowly—though there are many exceptions to this statement.

Pure silver, which is the best known conductor of heat, will, when polished, absorb radiant heat waves more slowly and likewise give it off more slowly, than any other substance. At the other extreme, we have

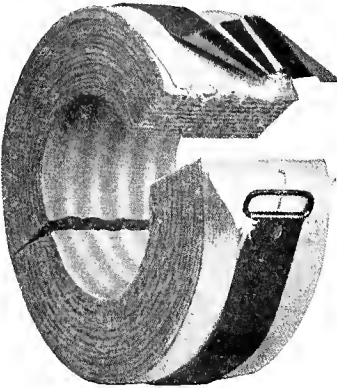
lamp black, which is a very poor conductor of heat, but which will absorb and disperse radiant heat more rapidly than any known substance. Then we have such substances as air, glass, and rock salt, which will neither reflect nor absorb radiant heat to a great extent but which have the power of transmitting it readily to other bodies. Rock salt, for example, reflects less than 8 per cent of the radiant heat which it receives, absorbs scarcely any, and transmits practically 92 per cent of it.

In general, we may say that smooth, light colored,

plane surfaces (approaching a sphere of polished silver) lose the least amount of heat by radiation and reflect the greatest amount. On the other hand, rough, dark, irregular surfaces (approaching lamp black) lose the greatest amount of heat by radiation and reflect the least.

Now, to recapitulate:

Heat transfer within a solid, homogenous body is by conduction. The rapidity of the heat transfer



Magnesia Protection
for Piping

varies with the nature of the body and directly as the difference in temperature between the hottest and coolest points.

Heat transfer within a mobile body is by conduction, augmented by convection currents. Its rapidity is dependent on the nature of the matter and on the velocity of the convection currents. The rapidity of these increase in some geometrical ratio to the difference in temperature between the hottest and coolest points.

Heat transfer from one body to another is by radiation—i.e. waves in the medium luminiferous ether. The velocity of these waves increases as the difference of the fourth powers of the absolute temperatures of the hottest and coolest points.

Now let us trace the flow of heat from steam in a pipe to the air surrounding it—

The molecules of the steam are vibrating with a certain rapidity commensurable with the indicated temperature. This movement sets up similar vibrations in the ether which permeates the spaces between the molecules. As ether has no boundaries, the ether waves in the steam, by the law of radiation, pass into the iron pipe. This sets up similar vibrations in the molecules of the pipe. By the law of conduction, the heat progresses from the inside to the outside of the pipe. Again, by the law of radiation, the heat is transferred by the medium, ether, to the surrounding air and by the law of convection the air near the surface of the pipe carries its heat upward and is replaced by cooler air, which movement continuously robs the pipe of heat. The speed with which heat leaves the surface of the pipe by radiation to the surrounding air will depend, of course, on whether the pipe is black or galvanized and whether smooth or rough.

THE ADVANTAGES OF TRADE ACCEPTANCES

When the contractor-dealer buys merchandise from jobbers, he will promptly check the goods upon receipt. Any claims will be adjusted at once. Unless he prefers to send a check within ten days he will sign an acceptance, that is, an agreement to pay a definite amount on a definite date. This of course entitles him to a little better terms (either cash discount or a longer time) than the man whom the jobber carries on open account.

Furthermore, the contractor-dealer who is running his business on sound lines can consistently sign and meet acceptance. He will thereby establish a good credit. The weak or careless concern will be showed up by refusal to sign acceptances, and will have to get into better shape or drop out. Of course a concern which failed to meet a signed acceptance would be blacklisted by the banks and on about the same basis as the concern which passed a bad check. In one sense,

altogether. Second: the contractor-dealer can use his funds in developing his business instead of carrying his customers, and will also have fewer losses and fewer unfair claims.

SEASONAL DISTRIBUTION OF FOG

Engineers will be interested to know of the results of a five-year study on the seasonal distribution of fog throughout the various coasts of the United States by the United States Bureau of Lighthouses. The figures indicate the following general facts: Fog is most prevalent along the New England coast in the summer months, and on the South Atlantic coast during the winter months. On the Middle Atlantic coast fog is more evenly distributed, the minimum amounts occurring during the late summer and early autumn. On the Pacific coast of the United States proper the distribution of fog is fairly uniform in all portions from north to south, the minimum amounts being observed

SAFETY NOTICES

SHOP BULLETIN, No. 1
ISSUED BY THE INDUSTRIAL ACCIDENT COMMISSION OF THE STATE OF CALIFORNIA

RESPONSIBILITY OF EMPLOYEES IN PREVENTING ACCIDENTS

Important Sections of Workmen's Compensation, Insurance and Safety Act

REMOVAL OF SAFEGUARDS IS ILLEGAL

VIOLATION OF SAFETY PROVISIONS

SEC. 55. No employee shall remove, displace, damage, destroy or carry off any safety device or safeguard furnished and provided for use in any employment or place of employment, or interfere in any way with the use thereof by any other person, or interfere with the use of any method or process adopted for the protection of any employee in such employment, or place of employment, or fail or neglect to do every other thing reasonably necessary to protect the life and safety of such employees.

SEC. 67. Every employer, employee or other person who...
visually or acting as an officer, agent or employee of a...
person

ПРОМЫШЛЕННЫЙ ВЪСТНИКЪ, № 1.

Издаваемый комиссией индустриальных несчастных случаев Штата Калифорния

ОТВѢТСТВЕННОСТЬ РАБОЧИХЪ ВЪ ПРЕДОТВРАЩЕНИИ НЕСЧАСТНЫХЪ СЛУЧАЕВЪ

Главныя правила вознагражденія, страхованія и акта безопасности рабочихъ.

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TYPICAL SHOP BULLETINS ON SAFETY

Much attention is being given to safety propaganda throughout the West. The resultant good effect is already noticeable in the saving of life and property. Here is a part display of a shop bulletin covering general rules for safety which has been distributed broadcast by the California Industrial Accident Commission. The bulletin is printed on durable cloth and has been translated into many languages, the one shown on the right above being Russian. A very marked degree of co-operation between the workers of the commission, the employers and the laborers has been observed in California.

an acceptance is much the same as a check payable at a future date.

Secondly, the contractor-dealer would ask for acceptances from owners or general contractors. That is, if the owners or general contractors do not care to give a check, they acknowledge the indebtedness and agree to pay on a specified date, i.e. they sign an acceptance. This acceptance the contractor-dealer can take to his bank and discount at a favorable rate (probably at $\frac{1}{2}$ of 1 per cent less than would be required on ordinary paper.) This means that the contractor-dealer will not have to carry his customers who need time, but shifts this burden where it belongs on the bank.

There are two chief advantages, then, in the adoption of trade acceptances by the contractor-dealer. First: the tendency will be toward sounder credit for the best concerns and forcing the shaky concerns either to strengthen themselves or be denied credit

in the spring and the maximum in the late summer and early fall, resembling, in general, the same seasonal distribution as obtains in New England.

PREFERABLE WIDTH OF TIRES

Width of wagon tires recommended for loads of varying magnitudes on earth and gravel roads has been made of especial study by the United States Department of Agriculture in a recent publication. The resultant conclusions may be of interest to central station operating departments:

Width of Tire Recommended for Wagons of Different Carrying Capacities.

Type of Wagon.	Gross Weight Loaded. Pounds.	Width of Tire. Inches.
1-horse wagon.....	2,000	2
Light 2-horse wagon.....	3,500	2½
Medium 2-horse wagon.....	4,500	3
Standard 2-horse wagon.....	6,800	4
Heavy 2-horse wagon.....	7,500	5

PRESENT DAY ENGINEERING PROBLEMS IN THE WEST

(Joint pole construction, automatic switch protection and the operation of standby stations for hydroelectric power are problems that have aroused unusual interest among engineers throughout the West where favorable conditions exist for development of vast quantities of hydroelectric energy and heavy demands are made for carrying irrigation loads. In the following pages these problems are discussed by a number of leaders in engineering thought along these lines and the careful weighing of the arguments that are advanced should prove very helpful in every section of the West. This discussion is taken from the stenographic report of engineering section of the Pacific Coast Section, N. E. L. A. Convention at Riverside.—The Editor.)

Chairman J. E. Woodbridge: One subject scheduled for this morning was left over due to lack of time, and that is Joint Pole Construction, on which we had a paper by the Secretary of the Los Angeles Joint Pole Committee. In San Francisco we are only starting joint pole construction, but even in starting we have learned some things, and I would like to ask Mr. J. M. Barry, formerly city electrician of San Francisco, to tell us about the organization of the committee there.

Joint Pole Construction

J. M. Barry: In San Francisco the joint pole system was started about a year ago. At that time there was considerable agitation for additional underground districts. In order to satisfy the public demand for better pole conditions, the board of public works, the city department of electricity and the representatives of the various railway, power, telephone and telegraph companies got together for the purpose of organizing a joint pole committee.

The joint pole scheme was not new with all the companies. Some of them had been operating under such arrangements in Oakland and in some of the smaller towns, and it was simply a case of adapting already established methods to San Francisco. The companies showed an excellent spirit in getting into the proposition, and since the organization a year ago many pieces of joint construction have been satisfactorily completed. The movement has resulted already in a falling off of the demand on the part of the improvement associations and the city for additional underground districts. We have an ordinance in San Francisco which authorizes the city to require that poles and wires be removed from $2\frac{1}{2}$ linear miles of streets each year. At the present prices of materials, $2\frac{1}{2}$ miles of underground construction annually would be a heavy burden, and the companies have welcomed relief from any direction that it could be found. The good record of the companies represented on the Joint Pole Committee has this year obviated the necessity of an ordinance requiring additional underground construction. This, I think, is a highly creditable showing. Under certain conditions, underground districts are desirable, but in San Francisco new districts have not always been wisely chosen. For example, the last one to be declared is very largely residential, with scattered loads, and is not a good underground proposition from an economic standpoint. It is hoped that joint pole construction rather than new underground districts will be the means of improving conditions in such localities in the future.

In connection with operation under joint pole conditions I think it would be well for the companies involved in the joint construction to complete their joint construction as soon as possible after deciding upon it. Very often, construction originates from a complaint from an improvement association because of bad pole conditions in some street. The intentions of the member companies are good, but there has been a tendency on their part to let the joint construction work go over until more important work had been disposed of. The result is, that there have been one or two instances where the improvement associations have questioned the good faith of the companies and have been on the verge of starting agitation for additional underground districts. For this reason, I think it is well for all parties inter-

ested to prosecute their joint pole work as diligently as possible.

Chairman Woodbridge: I believe Mr. Lisberger has served on that committee and can tell us something about the committee organization of San Francisco.

S. J. Lisberger: Mr. Chairman—The organization of the Joint Pole Committee is not difficult. The principal object in an organization under taking joint pole work is to appreciate the object you are trying to accomplish and most difficult of all you will find the prejudices and feelings of loyalty on the part of the several companies about to enter the agreement. If these will be thrown aside and if you will put yourself into the shoes of the other fellow, you will have in that one company is trying to get the best of the other wiped away most of the obstacles. There is always the feeling and it will take some little time and effort to overcome that difficulty.

Mr. McDonald has outlined the work of the Joint Pole Committee and I cannot add anything to his remarks. I do want, however to voice one sentiment, which I hope will not be misunderstood. Joint pole construction is advisable where several poles are likely to be located in the same locality. It is advisable from the standpoint of public opinion and there is no doubt that it does tend to relieve the burden of placing wires underground.

Joint pole construction, however, is not the ideal condition from the operating man's point of view. Many wires on the same pole are not ideal. It is true there is no more difficulty in having all the wire on one pole than in having several poles along side of each other, but what I wish to call to your attention is that if the several lines can be routed so that there will not be a multiplicity of wires on the same pole, it will be far better than having 11,000 volt, 2400 volt and 500 volt secondaries of several different companies on the same lead.

Joint pole construction is ideal from the point of the public under certain conditions. It is not the ideal on the part of the operating companies under the same conditions. This is particularly true in territories where ice and sleet are far more prevalent than here and it is largely for the benefit of the other operating companies, who read our discussions that I desire to make these remarks.

Chairman Woodbridge: In joint pole work, as in a good deal of other work, we often deal with other interests, notably the telephone interests. Mr. Warren has spoken to us this morning about inductive interference, and handles much of their relations with other interests, and is qualified to speak also on joint pole work. I will ask Mr. Warren for his views on joint pole work.

H. S. Warren: When Mr. Woodbridge said he would like to have a few words from me on this subject, I obtained a copy of Mr. McDonald's paper and have read it with much interest and find that it sets forth the general phases of the subject very comprehensively and in a way against which I have no criticism. The agreement which is made between different companies entering into joint use is a very interesting document. Of course, primarily, an agreement is a legal rather than an engineering document, but it is one of those things that has to be worked out jointly by the engineers and the lawyers. It has been my fortune to have spent consid-

ject, and while I do not wish to go into it at length, I will mention that it is one of the most interesting, and, I will add most difficult subjects to get on an absolutely equitable basis that I have ever encountered. I have for a couple of years been trying in conjunction with the lawyers to get up some equitable agreements on the several bases that Mr. McDonald mentions, joint ownership, permanent right, rental on the basis of space, rental on the basis of attachments. There are some situations where joint ownership is not regarded as the best arrangement.

The specifications from an engineering standpoint are the most important thing. Touching on the question recently mentioned as to the desirability of joint use, I think it is almost wholly a question of the specifications followed, whether joint use is desirable or not. About 10 or 12 years ago in the vicinity of New York there was a great deal of joint use, which had grown up indiscriminately. There had been no specifications covering it. The companies made attachments on one another's poles as seemed easy and convenient, and the result was that there were not adequate clearances and due regard to safety, and there were a great many accidents. So many accidents, in fact, that the companies took the question up and made a thorough study of it. A committee was appointed of two representatives from the telephone company and two from the electric light companies who worked about a year and got out an agreement and specifications. The specifications have been used very generally by the Associated Bell companies, so that, without any exaggeration, a great majority of the existing joint use is in accordance with that specification. I think substantially the same specification is used in Los Angeles and in other parts of California. That agreement and specifications were included in the report of a committee of the National Electric Light Association five or six years ago, and a very similar specification was worked up by the American Electric Railway Association about 1913 or 1914. This last specification is a little more general than the former one, but, insofar as they cover the same ground, they are about alike and I don't think there is any great difference of opinion on any of the engineering points unless it be that some of the power companies do not see the advantage of the voltage limit. In a general way the telephone company is strongly in favor of joint poles under proper circumstances, that is, with the class of electric circuits used in distribution where the lines of an electric company and the telephone company must necessarily be close together. We much prefer joint poles to conflicting construction.

When it comes to transmission lines of an electric company, there we find a different state of affairs, and I don't think under present conditions that joint use would be desirable, although there may be exceptions. As a general rule the longer lines had better be kept apart as long as that can reasonably be done.

Some reference was made to country distribution this morning. I have not studied that question very fully, as it arises more particularly in the western states, and I am not prepared to give any final opinion on it. However, I should say, if the voltage is high, as long as there is room to keep apart, we prefer to do that, so far as any economic question is concerned. That is, the mere saving in a joint line would not, in my opinion be a sufficient justification for the hazard of going into joint construction with a high voltage line. Of course, if the voltage is low enough so that no especial hazard exists, it would be the same as town distribution and joint construction would be desirable. The various advantages of different methods are set forth well in the paper, and nothing occurs to me in particular to say further except to repeat that we believe fully in joint use for town and city work.

E. R. Northmore: Mr. Macdonald's paper covered the Los Angeles condition very thoroughly, but there are a few points that I want to bring out.

Ten years ago, when joint pole construction was commenced in Los Angeles, there were three electric, two railway and two telephone companies operating on separate pole lines trying to occupy the same streets together. These seven companies formed a joint pole committee and the specifications applied to the conditions at that time, but state laws, railroad commission rulings, changes in the N. E. L. A. specifications, etc., have so changed the construction that these specifications and contract are not now suitable for the work, and our experience has taught us that a joint pole contract should be drawn up to cover every possible contingency and the specifications made so that the joint pole committee can change the specifications as conditions, laws and other changes come up. This joint pole committee in Los Angeles has been working harmoniously for ten years. By co-operating and working together trying to settle the difficult questions that come up by seeing them from the other fellow's viewpoint as well as our own, we have been able to settle practically all questions unanimously.

We have found that our operating and repair cost on our line construction has decreased at least 50 per cent on account of joint pole work. One of the great helps is pole moving made necessary by street improvement work. Formerly the city engineers and the contractor would phone every pole using company in the city advising them that street work was to be done on certain streets and for them to take care of their poles. This necessitated the sending of men by every company to attend to the work. The joint pole secretary is now made the clearing house for all work of this kind. All communications concerning work of this kind are sent direct to the joint pole secretary who, after inspecting the work to be done, makes the necessary recommendations to the companies who are interested in pole moving on that individual street. This prevents the unnecessary trips of the companies who have no poles, or whose poles happen to be in the right location.

I disagree with Mr. Lisberger where he says there are conditions where combination poles are not advisable. I cannot conceive of any proposition where a combination line would not be better than two, three or four lines placed on the same street. If lines get so heavy that they can not be supported on combination poles it is then time to either go underground or string part of your lines on another street.

R. E. Cunningham: Most joint pole agreements, principally the Los Angeles agreement, are on the joint ownership basis. We prefer that arrangement, because once having recorded the combination it takes care of itself as a matter of record after that. But we have had a number of cases where it was necessary to consider a rental basis. This has been the case with the independent telephone companies who don't care to consider the joint ownership agreement. We don't favor the rental agreement because we have each year to check up all the existing joint poles and prepare bills to cover the rental from one company to the other. If there are any men here who have had experience with the rental agreement and who have had a better way of handling the record than what I have outlined, I would be glad to hear from them.

C. O. Poole: I want to raise one question that probably Mr. McDonald can explain, and that is as to how it is working out and is going to work out in reference to franchises. There may come a condition where one company might work itself out of a street entirely and have no rights there. I don't know how that would operate on some of the constitutional franchises. The franchises given today call for specific streets and they can only build on those streets. I can see where it might be possible where one company in some locality might have all the franchises and the other party would have nothing to operate under.

J. E. Macdonald: It is assumed that each company participating in joint pole construction in any location has a franchise to operate in that location. If this is the case,

its rights to set poles or own poles in such location would not be affected by its participation in the joint construction.

The most vital part of the joint pole scheme is that of proper records. The Los Angeles system expanded from less than 3000 poles recorded in 1907 to nearly 23,000 recorded in 1916. The problem is simple until replacements begin to be required, and the fact that the amount involving each pole replaced is small demands an extremely simple method to prove effective. Formerly it was necessary for the committee to make an inspection of all combinations as well as replacements, and as the territory covered a large part of Southern California, the cost of recording a combination pole or a replacement was excessive in some cases. About two years ago, the committee undertook to solve this problem so as to avoid unnecessary duplication of functions by the committee and the companies' employees. Records are now made and settlements effected in accordance with the data furnished to the committee, by the companies. The disposition of joint property removed from service is another item which should have special consideration. In many cases the poles removed from service are of little or no value, but it is quite essential that each company should receive its proper proportion of the salvage value. Standard salvage values have therefore been adopted. An attempt is first made to divide the property equally among the joint owners and the remainder, if any, is taken by one of the joint owners, preferably the original owner, and the other companies are authorized to bill against this party for the proper proportion of the salvage value.

Automatic Switch Protection

Chairman Woodbridge: Like Banquo's ghost, the question of protection against overloads will not down. It has been with us ever since distribution started and probably always will be with us. The large eastern companies with their comparatively heavily loaded and shorter feeders have made great developments recently along the line of automatic switch protection with relays. With us the problem becomes more one of fusing the individual service or transformer, which is often miles away from headquarters, requiring long trips to replace fuses. We have obtained for this meeting a paper by Mr. Cunningham, and an expression of views by several members of the committee, all of which have been published. I hope this published matter has been read and that it will develop further discussion at this time.

J. S. Thompson: The Pacific Gas & Electric Company commenced the manufacture of switches, both of the oil and the other types, almost at the beginning of their construction work; and naturally that led to the development of our local manufacturing industries. There are several manufacturers of switches on the coast making both oil and air break circuit breakers. I am going to pass by the oil switch phase of the question and take up with you what would seem to be the more perplexing phase, the protection of equipment by fuses. The oil switch has been brought to a point where it is not a questionable piece of apparatus. It is as satisfactory as the transformer and the generator. The fuse, on the other hand, is quite as distressing as it was in the beginning, and I am sorry to say, as it is now and ever shall be. In the first place, this crude way of protecting apparatus means simply to say, "We will select the weakest part of the circuit and in case of trouble localize the trouble there." And a method of protection that depends on the destruction of material cannot be a very advanced engineering method.

I sell fuses by the thousand. But "I come to bury Caesar, not to praise him." I hope to sell thousands more. There is no more adequate protection within the limits of engineering economy than the fuse for single-phase operation. In multi-phase installations there is the danger of a single fuse rupturing and bringing about a single phasing of the system, though this does not militate sufficiently to prevent protec-

tion, with fuses, of the thousands of small installations which do not warrant automatic protection. I say they do not warrant it, but I should say that they heretofore have not. If the only thing I sold was fuses, I would not be here now, because I predict that the day of the fuse has practically reached its zenith, in engineering distribution, and the manufacturer will be forced to furnish low-priced automatic protection down to the most inexpensive equipment in time, and you who operate will be forced to purchase that equipment.

Then we are confronted with the question, what fuses? What means of protection? If there were an ideal material, it would be a material indestructible through fire, with mechanical strength to permit it being dropped from a building without injury, that would be transparent so that the fuse could be inspected. This ideal material has not yet been perfected. Perhaps you will have to wait until the Germans, what is left of them, get back to the laboratories. In the meantime you will have to use material that meets as many of the requirements as possible. Glass has the faculty of being indestructible by weather conditions and heat but it is fragile. Bakelite meets the mechanical requirements and has the features of resisting warping or weathering, but its point of ignition is so low that if the fuse wire is heated up to a point still short of its fusing or melting point, that point could easily be higher than the burning temperature of Bakelite. Therefore it is necessary to put a protective material around the fuse, keeping it away from the fuse tube. This acts in a measure to diffuse the heat and keep the fuse wire from sagging over against the material and setting it afire. But, like the fuse, it is only a makeshift.

The proper size of fuse wire is a matter of vagueness and is incapable of being fixedly determined. A fuse wire surrounded with silica will conduct one hundred per cent more than the same wire exposed to the air. Similarly rated fuse wires, we all know, have different ranges of fusing points, to such an extent that when fuses are ordered by the operating man he orders a fuse very often in which the load that is to be placed upon it is so close to the fusing point that he brings it up to a very high heat, and the result is a slow oxidation of the fuse wire resulting in the gradual reduction of its cross-section and a consequent fusing point much lower than when it was new. These points are almost insurmountable. For that reason I make my optimistic statement that the solution of the fuse is to get rid of it. You have simply this one point: you must have a weak point in your system under the theory of fuse protection, and your aim, of course, is to make that weak point as inexpensive as possible, so that when it is destroyed the minimum of value will be destroyed.

A. Bowie: One of the subjects which I did not see touched on by Mr. Cunningham is the question of branch line protection. The protection of a branch line by fuses has serious drawbacks, because, for the reasons stated, if one of the fuses blows it puts the motors on single-phase, and may burn them out. There is no question but the protection of branch lines will be greatly improved by automatic circuit breakers, which is the only practical means to do this work.

The matter which Mr. Thompson touched on about the fuse and fuse tubes, is of considerable importance in the general design of any apparatus. As far as it is practicable, it is of prime importance to be able at times to look at a piece of apparatus and tell exactly its condition. If you cannot inspect the apparatus, you have to guess at the condition of the contacts and so forth.

Many materials are not as fully investigated by manufacturers as would be advisable. Such for instance, as the matter of creepage of current over materials subject to voltage for a long period of time. There is a strong tendency to go more into the use of porcelain and glass throughout, and to do away as far as is practicable with all other classes of material for high tension insulation. Deterioration of ma-

terials under stress is of prime importance in that connection.

The indestructibility of the apparatus in switch construction is important. The development of the oil switch up to date has finally resulted in the oil itself being practically the only inflammable material used therein, and the oil switch is probably the only piece of apparatus which embodies any material of such a nature. In every other instance all materials subject to deterioration have been eliminated as far as possible.

J. S. Thompson: May I add a word or two? I think I may speak to you a little optimistically on a subject which I did not think of because of my frank pessimism as to one of our products. That is, a switch that we are developing in which an oil insulated member in the form of a plunger is mounted on a line insulator, and a switch blade is arranged to come down and press it into the closed position. This switch has aroused the interest of all the engineers who have seen it. It has the feature of giving the oil break and the air gap so that it will be evidently open, and at the same time the duty of breaking the circuit will be under oil. Part of my pessimism as to the fuse is on account of my optimism in regard to this switch we are perfecting in our factory.

D. J. Butts: A statement was made that the usefulness of the fuse has passed. It seems to me there is still a good service that fuses can perform in protecting high tension or secondary distribution work, i.e., 2000 to 15000 volts. The field is in branch lines.

If all distributing lines could come to a station switchboard the automatic oil switch would afford the proper protection but, owing to the geography and topography of the country, it is difficult to make all lines come to a central point and it is necessary to protect some branch lines at the poles. There is a serious objection to automatic oil switches for this service for the reason that sometimes months elapse when the switch does not operate and being subject to weather conditions and temperature changes anything mechanical is apt to fail when it should work. For cases of that sort a fuse that will open the circuit properly, say from 2300 to 13000 volts, still has a field.

The Western Electric Company is marketing such a fuse and it operates in oil. The fusing link is an aluminum strip about an inch long and supported by spring fingers. As soon as the fuse blows the fingers open out, making the distance between points up to four inches. The fuses operate within 12 per cent of their rating and will open under short circuit conditions rapidly, without injury to the renewable link. The renewal cost is about 12c.

H. A. Barre: I do not like this general tendency toward increasing the cost of distribution by the use of protective devices better than the fuse. The most serious thing we face at the present time, and practically at any time, is the cost of consumers' installation. Recently we had much fuse trouble in a district having a connected load of three or four thousand horsepower and an average size of installation of about ten horsepower. Investigation showed the total cost of replacing these fuses to be about \$250. To equip the installations in this district with any of the types of protective devices under discussion, other than the fuse, would cost many times \$250. This cost would be prohibitive, even under ordinary conditions.

At present we are facing a situation which will require that all possible resources of the power companies shall be directed to the extension of their distribution systems into agricultural districts. We, in conjunction with the manufacturers, must devote our efforts to meet this condition and reduce the cost of service. We may burn up some transformers and meters, but we must keep the cost down.

L. M. Klauber: There is one point with reference to the fuse situation that I wish to mention as I believe no one has touched upon it. While I am no friend of the fuse, I desire to mention this point because the fuse is often blamed

for the burn-outs which should not properly be charged against it. We often have a fuse blown or a transformer burned out and then in investigating we consult the trouble or installation man and inquire. "Bill," how was that transformer fused?"

Says Bill, "Well, the transformer had a full load capacity of 5 amperes, so I fused it up to 10 amperes."

"How did you do it?"

"Well, I didn't have a 10 ampere fuse with me, so I took three 2's and a couple of 3's and added a 5, and then I twisted them all together, because I figured that the combination would be about equal to a 10."

Or some times Bill says, "Well, when we installed that transformer we had used our last fuse, but we found some light copper wire—I don't remember whether it was a No. 12 or a No. 26, but we used it, and I think it ought to hold."

Of course this may be exaggeration, but we found that a lot of our fuse trouble resulted from this sort of improper fusing; so we have made up standard fuse kits consisting of sheet metal boxes with hinged lids. In the bottom of the kit are compartments for holding all sizes of 2300 volt link fuses which the troubleman may require. Above these are placed a set of 11,000 volt expulsion fuses, each size being in a separate waterproof tin cylinder, labeled with a brass tag. Also there are a couple of spare fuse holders. On the inside of the cover of the kit is pasted a schedule showing the proper size of fuse to use for each size of transformer installation. We find that when all troublemen and installation crews are equipped with these standard fuse kits, much fuse trouble is eliminated.

R. E. Cunningham: I believe that all of our experience goes to show that fuse troubles increase almost as the square of the voltage. I certainly am sure we have more trouble with the high voltage fuses than the low. Take the fuses on 110 or 220, and nobody would think of trying to use any other protection for those small loads. But with the scattered load which we must serve in the rural districts, we must use higher voltage for the distribution circuit, and my contribution has been on the 11,000 volt system. For 3-phase power loads of considerable size you will have to plan a little more protection, if it can be found, than the fuse protection. The oil switch which is described in the article, I believe, is only one method which could be worked out. I have told a number of manufacturers' representatives that I believed some automatic air-break system could be worked out, although I could not tell them how to do it, but I believe there are other methods which could be worked out. In the matter of 3-phase transformers, we propose to use these transformers on the 11000 volt circuits to keep down our expense of distribution and installation. From the curve shown in the paper you can see that there is a saving, and I believe if the other member companies would adopt the use of 3-phase transformers and bring them into general use there would be further reduced cost from what is shown by these curves.

Standby Stations for Hydroelectric Power

Chairman Woodbridge: In the matter of steam stations, our service is usually a standby to hydroelectric power, making the operating conditions of our steam stations very different from those which are carrying the whole load. Mr. Morgan has given us a very good paper on the operations of the Redondo station under such conditions. One of the main questions that arises in such operation is how closely can steam be cut off in a steam turbine, without difficulties or danger to the turbine. There is no better synchronous condenser, as a rule, than the steam turbine installed as a standby. In general, the turbine, without load, has ample capacity for over excitation. Difficulties have been experienced when the steam has been cut off altogether, due to the over-heating of the turbine blades. Several companies have tried it, and I believe we should get a comparison of

the results because the results of one company are generally different from those of another, and some companies have very different views from others on the subject. The San Joaquin Light & Power Corporation has operated turbines in this way and I would like to ask Mr. Quinn for the results of their experiences.

E. A. Quinn: We operated a 2000 kilowatt Curtis horizontal turbine without steam. When the turbine was synchronized, steam was cut off. The hand hole plate on the low pressure portion of the steam end was taken off. On the high pressure end there are two small hand hole plates. These were removed and air piped to them from the generator air chamber through four 1½ in. pipes. The highest temperature recorded was 280 deg. F. Turbine was operated as a synchronous condenser for about four years without cooling by steam and apparently blading was not damaged. The machine is now being used as a generator.

W. J. Davis: It is often very desirable to be able to operate steam turbines as synchronous condensers for regulating the voltage of the system. In so doing it is necessary to pass a small amount of steam through the turbine in order to carry off the heat generated in the blading by the rotation losses. In several cases brought to my attention, turbo-generators have been operated as regulators without steam with the object of saving fuel. Two methods have been employed. In one, an inspection plug in the turbine casing has been removed, the turbine blades revolving in air at atmospheric pressure. In the other method, a vacuum is held on the turbine and condenser by operating the air pump, but the throttle valve of the turbine is kept closed. In both of these cases, excessively high temperature of the blading will result, with the possibility of serious damage. When the blading is rotated at full speed in air at normal pressure, high temperatures are caused by abnormally high rotation losses. If rotated in a vacuum of 28 to 29 inches, the rotation losses are greatly reduced but not entirely eliminated, as it is impossible to obtain a perfect vacuum, and even a very small rotation loss will result in high temperatures because there is no medium for carrying off the heat. The condition would be similar to that of an incandescent lamp.

These high temperatures cause the bronze blading to become brittle and to crack and there is also a loosening of the blading in the dovetails which will eventually lead to trouble.

The amount of steam required to keep the blading cool is small and will probably not exceed a thousand pounds per hour in most cases, when a good vacuum is maintained.

In rare cases, the cost of maintaining steam might be so great as to materially exceed the cost of reblading the turbine periodically, in which case the operating company might be justified in running a turbo-generator as a synchronous condenser with the throttle valve closed. I am inclined to believe, however, that even in these cases, a properly designed synchronous condenser would prove better in the end because of its greatly superior efficiency.

P. M. Lincoln: I am not prepared to speak with a great deal of knowledge on this, but I do know of a number of cases where turbines are being run successfully as synchronous condensers, but in none of the cases that I know of are the turbine blades operated at atmospheric pressure. In all the cases I know of there is a sufficient amount of steam kept running through the turbine so that a reasonable amount of vacuum is obtained and the blades are rotating in a vacuum. When this is done there seems to be no reason to believe that there is sufficient temperature developed to fear on that score.

Another objection that occurred to me to operating the turbines with atmospheric pressure, is the loss that is bound to occur when that is done. I don't know just what that would be, but it is quite evident that losses that would take place in the blading would be high and consequently the operation under that condition must be carried on at a con-

siderable loss. One of the systems on which steam turbines are being successfully operated as condensers is that of the Southern Power Company. They have several turbines on their lines at various points and are operating them as synchronous condensers. I cannot name any others at present, but I do know that it has been done to a considerable extent.

J. A. Koontz: I don't know that I can give you any accurate detail of our method of operating on the Great Western System. I have not followed it very closely. For the past two or three years we have "floated" a station in Oakland, and a good deal of the time under vacuum, and without steam. To take care of the absence of steam for the auxiliaries (the dry vacuum pumps being normally steam-driven) we operated them on compressed air, having a motor-driven air compressor of sufficient capacity in the station. To date I don't know of any serious trouble. At one time we had numerous thermometers placed as well as we could judge over the turbines, with the throttle closed, and we got a sudden shutdown and opened the valves wide open to carry load and the heat broke all the thermometers. So the thermometers were either not giving us any idea of the temperature when running without steam, or something else was wrong. We lost all the thermometers, when the superheated steam was put through the turbine at 200 pound boiler pressure. Mr. Davis is entirely familiar with this installation and he has been in closer touch with it than I have. I don't know that there was any deterioration of the blades.

W. J. Davis: In a great many plants, turbo-generators are operated as synchronous condensers but in nearly all cases, it is customary to allow a small amount of steam to pass through so as to carry off the energy losses in the blades. Mr. Koontz's experience has been fortunate and unusual because his turbines have blading of steel and Monel metal which is capable of standing a very high temperature without injury. My experience has been that injury will ultimately result if no steam is used as it is not feasible to measure the actual temperature of the blades. All we can do is to periodically examine the blading to see if there is any loosening in the dove-tails or shrouding, or whether the metal has deteriorated in tensile strength and elasticity.

J. A. Lighthipe: The great source of losses in running steam turbines as synchronous condensers is the fact that you have all your auxiliaries working with steam. But the modern system when you are using the turbine as a standby is to have all the auxiliaries motor driven. Then the amount of live steam to keep the turbine cool is very small. I think that is the trouble with most of them—that they use steam in circulating the water and running all the auxiliaries necessary. That is where the live steam goes to. If they were all motor-driven and the steam used absolutely went to keep the turbine cool, I think it would be very small.

J. A. Koontz: I would like to ask one question. No doubt motor-driven auxiliaries are advisable from the standpoint of economy in standby stations. But where we are attempting to standby to give A-1 service, the minute the system is in trouble the auxiliaries are also in trouble. We operate another turbine station in San Francisco, which with its load we cut loose from the hydro system in case of trouble, and the synchronous sets do not fall out of step.

But in other stations where we attempt to hold any load we are not able to do that. Wherever we attempt to use motor-driven auxiliaries we only magnify our troubles, and I was wondering whether Mr. Lighthipe had any particular means of overcoming this trouble.

Mr. Lighthipe: My steam would cut itself loose, that is all.

The Chairman: The paper covered a great many other phases, particularly the organization and so forth, of picking up loads in emergency and in a hurry. Some of the other companies are up against the same problem, and the Pacific Gas & Electric Company in particular has developed it to a

high point of effectiveness. Mr. Eastwood who has charge of one or more of their stations tells me that their station A in San Francisco as a rule will pick up 18,000 kilowatts instantly, and has done it. I would like to hear how he does it.

P. M. Downing: In the absence of Mr. Eastwood, I think, perhaps, I can answer this question. In the discussion thus far regarding the use of turbines as synchronous condensers one important point has been lost sight of. Turbines are installed not that they might be used solely as synchronous condensers, but primarily to carry load when trouble occurs on the transmission lines. They must be ready to pick up load on a moment's notice, and anything that might damage the machines, or make them unavailable for use when needed, should not be done.

On the system of the Pacific Gas & Electric Company the turbines float in on the transmission system the greater part of the time. We do not attempt to operate them without steam. The loads carried range between 5 and 10 per cent of the full load capacity of the machine. When you consider that they are ready when called upon to pick up full load on instant notice, the fuel consumption we do not consider excessive in view of the guarantee of continuous service. In San Francisco at the present time, approximately, 80 per cent of all of the power supplied comes from transmission sources. In cases of transmission line trouble the turbines are separated from the transmission line and pick up the load without the consumers knowing that trouble has occurred. While they are operating as synchronous condensers the field excitation is adjusted so that when they pick up the load and are separated from the transmission system, no great amount of field adjustment is necessary; in other words, we have found it inadvisable to carry the excitation on these machines operating as condensers very much higher than would be required if they were operating as generators. By operating in this way there is less disturbance to the voltage when separating than there would be if it were necessary to readjust the field excitation.

We have two routes over which energy from the transmission system can be supplied into San Francisco, one from the south by the over-head lines coming up the San Mateo peninsula, and the other by submarine cables across from Marin County. Both of these are supplied from the same inter-connected net work of transmission lines, but they are not tied together through the cable system in San Francisco. Ordinarily there is a slight phase displacement between the two due to the different characteristics of the lines supplying them. Separate turbines operate in parallel with each line and the two circuits. In other words, these two are therefore tied together in San Francisco only through the boilers. The advantage in operating in this way is that trouble, on one end of the system rarely effects the other end, and we are thereby able to obtain the same guarantee of continuity service by using fewer boilers.

R. J. C. Wood: Mr. Chairman and gentlemen, so far we have only heard about the turbine and its ability to carry load, and how much steam it should have. But the real fun begins in the boiler room when a sudden call for power comes upon you. Mr. Morgan's paper shows that if the boilers are practically cold and just carrying sufficient steam to supply the auxiliaries—I think he carries them on one boiler—that he can pick up about 5000 kilowatts in one minute. Now, if you have been carrying even a little load you can do a great deal better than that, and you can pick up in our case eight or ten thousand kilowatts almost instantly from a previous load of 4000 kilowatts, which does not mean that our plant is working any better than his, but that our conditions are different. If there was some way of keeping the brick work in the boiler hot without burning too much oil, half the problem would be solved. The stored heat in the brick work of the boiler is about 25 times the stored heat in the water, and the main trouble in getting up quick steam in the cold boiler is that you cannot get perfect combustion. You try

to get a lot of oil in, and all you do is fill the boiler with soot. For that reason I think the electric auxiliary is the right line to pursue. In Mr. Morgan's case you have one boiler taking care of all the steam, and when the trouble call comes that boiler is not available for carrying load purposes, and you have to depend on your cold boilers to supply the load. If you have electric auxiliaries you can carry a minimum load on your turbine and shift your fires from one boiler to the other to keep them all comparatively hot, and then when your trouble comes you can pick up load much quicker. With regard to the by-pass valve which Mr. Morgan installed, permitting a small amount of steam to pass through the turbine all the time, we had considered a slightly different arrangement, which would be to shift the cams on the governor shaft so that there will be an interval between the first cam and the second cam, regulating the drop of speed to two per cent between the first and second valve. The turbine would operate on the first valve unless something happened on the system to drop the speed 2 per cent, and then it would go on the rest of the valves as if nothing had happened. This arrangement would relieve the operator from watching all the time to keep the load at the minimum value. But Mr. Morgan's device has the advantage of being put into actual operation and ours has not, and thus ours is only a matter of theory. I notice he tests out the over-speed tripping device once a week. We have had some experience with the tripping device which has not caused any trouble, but which has led us to consider it advisable to test it out every time we shut the turbines down, in fact, that is the way we shut them down. We speed them up until the trip comes out, and we have found a sufficient number of times that we had to speed up higher than we anticipated and so we believe that that is a very good insurance to operate in that way.

Mr. Morgan does not say anything about condenser tube corrosion. I was wondering if he had found any more corrosion on standby than during normal operation, or whether the corrosion is proportional to the number of hours the turbine is run.

I think we owe a debt of gratitude to Mr. Morgan for writing a paper of this kind, because we never get enough of these papers telling us about our troubles. I think every one will agree that the standby plant is a trouble. At the end of the month a lot of money has gone out and nothing tangible received for it.

Heat Insulation for Boilers

Chairman Woodbridge: Mr. Wood has brought up the question of the amount of heat that should be stored in the walls of the boiler and which must be stored before you can get good combustion. That immediately brings up the question of thermal insulation of the wall. I understand that there has been work of that kind done, and I would like to call on Mr. Russell.

S. P. Russell: Our company is insulating a great many boiler setting walls. This is not only to save the heat transmitted through the boiler wall, but to store up more, heat in the brick work (which is very important in a stand-by plant, where it is sometimes necessary to instantly pick up a load, 25 to 50 per cent greater than the normal rating of the boiler plant), and also to secure greater efficiency by eliminating infiltration of air through the brick work of the boiler, thus increasing the per centage of CO₂ content of the flue gases.

I understand the Pacific Gas & Electric Company increased the efficiency of their boilers about 5 per cent by insulating their boiler settings, and it is because of the vast amount of heat stored up in their boiler settings, by this insulation, that they can instantly pick up a load of 20,000 kilowatts, without any material drop in their steam pressure.

Chairman Woodbridge: Is this heat insulation outside of the wall, or, is it inside or between different sections of the wall, thereby cutting off part of the wall?

S. P. Russell: It would allow the boiler wall to store more heat, if on the outside of the brick work. It might also be placed on the interior of the brick work, if you can arrange for it, at the time of the construction of the boiler work, placing it between the fire brick and the red brick, but you would lose the advantage of storage capacity of the red brick.

G. C. Wood: I am very much in favor of having an air tight casing on the outside of the boilers to stop air leaks. But it seems to me if you put a perfect heat insulator on the outside of your brick and then run your boiler long enough, you will have the case of the turbine blades and the filament of the lamp, and the brick will lie a molten puddle at the bottom. We have considerable trouble now with brick deterioration. The only thing that stops the fire brick from melting all the way through is the loss of heat from the outside. If you stop that you are going to melt your brick all up.

L. M. Davis: I know one case in one of the standby plants on Second and Townsend. This plant was built by the city for the water supply system and was only to be run in connection with the regular high pressure system. All of the boilers in this plant are covered with two inches of non-conducting material outside. It was found that steam pressure could be kept up on each boiler at the expenditure of one barrel of oil a day.

C. O. Poole: We operated our steam plant at San Bernardino at the end of our transmission system as a standby plant for a little over three years. We ran one of our sets as a synchronous condenser. We got very satisfactory results in the operation of the condenser for regulating voltage. We used in the plant at that time two boilers, two 500-horse power Stirling boilers, and we keep them up to 175-pound steam pressure, using 30 barrels of oil per day. We could not find any deteriorating effect due to the operations. Under ordinary conditions we tie in with the Southern California Edison Company, and we shut the steam plant down and keep two of our boilers filled up with water for any emergency that might come outside of what can be taken care of by the plants in operation. It takes us about three hours to get steam up when we have to do it. Of course, that is a disadvantage.

Don Mongan: Mr. Chairman and gentlemen, in the Redondo plant our case is a little different from some of the others. Mr. Davis of the General Electric Company has recommended that the best thing to use was a condenser manufactured for that purpose, and not to use a steam turbine. We are trying to accomplish two things with the steam turbine. One, an emergency standby feature as well as getting the condenser effect, although the turbine is not operated except at such times as it is needed as a condenser. In our case, we feel that we accomplish two purposes with one piece of apparatus.

Another point brought up was in reference to electric auxiliaries instead of steam. In the event of a complete shut down of the hydraulic source of supply, steam auxiliaries are almost necessary to get your turbine quickly into service. Of course, there is a loss of steam which is a very considerable item when the turbine is operating as a condenser only.

We had intended to operate the turbine as a condenser without any steam, but we got cold feet on the matter and took it up with the General Electric Company; they advised strongly against it, and we finally worked it out as mentioned in the paper.

Some of the data in connection with our tests had been lost, the chief engineer was asked to duplicate tests. With the turbine connected to the line, he closed the throttle and found he was getting the same temperatures as the tests we made sometime ago with the by-pass throttle partly open. It was evident that there was sufficient steam leaking by the throttle to supply all that the by-pass throttle would take. This

was not only apparent from the temperature of the blading but also from the indications of the integrating watt-hour meter. I am wondering if some of the experiences related here in reference to operating turbines as a condenser with the throttle closed are not similar to this experience and that as a matter of fact, they were giving the turbine considerable steam on account of a leaky throttle.

Another point brought up was as to the cost of operation under these conditions. We spend approximately \$10,000 a month which is principally in the way of insurance and there is a lot of oil used and nothing to show for it. During the summer season the station output is a minus quantity due to the energy required for electrically driven auxiliaries, and the dry out of the generators.

Mr. Wood brought up a point in reference to troubles in the boiler room and I fully agree with him. The boiler room is the hardest place to get along with any degree of speed. When an emergency arises, if the boilers are cold, you get nothing but a cloud of black smoke through the stack, and very little improvement can be made until the plant is thoroughly warmed up. We are not attempting to hold the full output of the Redondo plant for standby purposes, the intention is to be able at all times, to pick up the commercial load.

Employment of Engineering Students

Chairman Woodbridge: This discussion practically concludes the consideration to be given to the papers that have been prepared for this convention.

We have one matter of business left over from this morning, brought up by Prof. Scrugham. If he is here I would like to hear from him.

J. G. Scrugham: The N. E. L. A. Committee on Relations with Educational Institutions desires to call your attention to the matter of employment of engineering students during the summer months. We suggest that their services can be utilized to advantage by practically all of the member companies of the association. A circular letter on the subject has been sent to most of the officials present at this meeting. The Electrical World is conducting a department of electrical research under the direction of Prof. V. Karapetoff. I believe that we should actively interest ourselves in the matter, by recommendation of certain specific problems for research. The chairman, Mr. Woodbridge, has made some suggestions which I would like to have discussed.

Chairman Woodbridge: Research along two lines came up this morning, one the life of porcelain insulators, and the other various factors involved in inductive interference. I should like to have suggestions for any other research work that might be considered and referred to Prof. Scrugham and Prof. Karapetoff. In the absence of any other suggestions. I would like to have the meeting take some action on this matter.

H. A. Barre: I move that the subjects that you have mentioned be submitted for research.

(Said motion is seconded and carried.)

Chairman Woodbridge: I think a motion also would be in order thanking those who have prepared papers for this convention. The committee was a little slow in organizing and we did not have very much time after it was appointed.

J. S. Thompson: I move that a vote of thanks be extended to the gentlemen who prepared papers.

(Said motion is seconded and carried.)

The great value of electricity and the possibility of its generation and distribution on a large scale in the modern stage of technical progress in a land which has an abundant supply of water power, coal beds, and peat bogs have gradually created the conviction that this is a matter in which the government itself should take an active part with the object of promoting economic welfare.

SHORT JOURNEYS IN PACIFIC LANDS

(Our Pacific neighbors continue to contribute their share of interest to those who look ahead a decade or two and picture to themselves the new world that will be upon us at the conclusion of the present world war. National phenomena unknown to American practice must be dealt with and the commercial customs of new and strange peoples analyzed. Here are some observations made by representatives of the Journal of Electricity in foreign lands, the first by the editor of the Journal, while on a recent tour of the Orient, and the second by a well-known Pacific Coast engineer now making a tour of the West Coast of South America in an endeavor to size up possible future commercial and engineering relations with our neighbors to the south.—The Editor.)

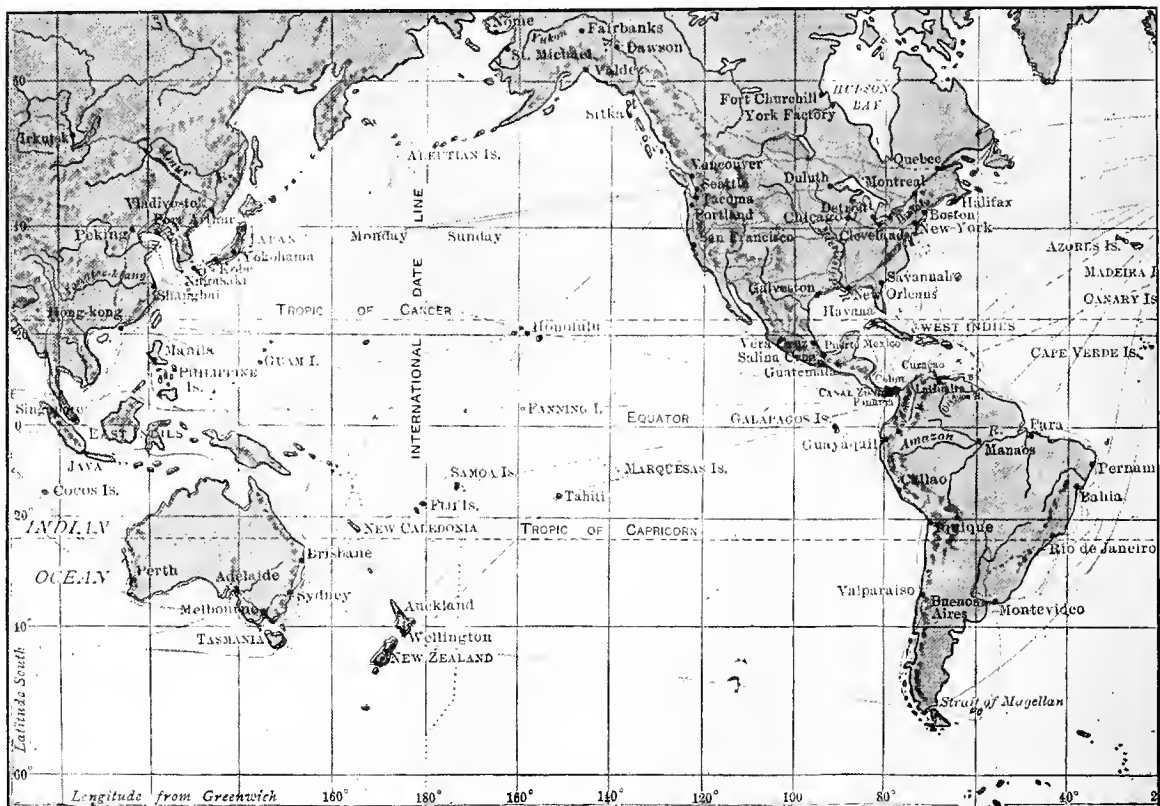
The Loss and Gain of a Whole Day at Sea

The engineer of the Far East who desires to file reports simultaneously with certain reports of the home office has another phenomenon of the mid-Pacific to bear in mind—namely that of the loss or gain of a whole day at sea.

As the traveler sets out by rail on a westward journey from New York, the porter usually advises him

correction you find yourself at midnight Thursday evening beginning the morning of Saturday, with no Friday in between.

Many a man has longed in his soul to live his life again. To a certain extent this opportunity is granted him upon his homeward trip for the correction is made in the opposite manner, and one is compelled to live the same day twice. As if Divine Providence



THE GREAT COMMERCIAL AND ENGINEERING ARENA OF THE FUTURE—THE LAST NEW WEST
The International date line shown on this map explains why engineering cable reports often appear on the Pacific Coast, bearing a date that would make the event appear as happening a day before it actually takes place. Countless other new and strange reckonings must be made by the engineer of the future who would engage in business and engineering enterprises with our neighbors that inhabit these promising fields of future endeavor.

each morning to set his watch back an hour, for the rapid motion of the train counteracts the motion due to the rotation of the earth; hence, a daily correction is necessary.

In traveling across the Pacific a peculiar incident occurs about midway between Honolulu and Yokohama. The hands of the clock having been set back so often, have in fact lost a whole day of twenty-four hours. In a word, a place is reached where the end of one day and the dawning of another are simultaneously taking place. If for instance the day you have just been living is Thursday, you now find that Thursday commenced at this place just twenty-four hours previously. Hence in order to make the proper

were forcing upon us the solemnity of the point at issue, our day proved to be Sunday, July 5th. So that, having enjoyed the celebration of a glorious Fourth of July at sea, two Sundays, the one following upon the head of the other, were granted us for religious services, peace, and rejuvenation.

Coming back again to the engineering considerations of this losing and gaining of time, we see in conclusion that one should bear in mind the transposition of dates. Otherwise, happenings in the Orient and Far East may bear upon the cable message or file sheet, a period of a whole day in the home office prior to the real happening of the event in the far country where the work is being prosecuted.

THE ENGINEERING AND COMMERCIAL OUT-LOOK ON WEST COAST OF MEXICO

BY J. W. FINCH

Some years ago a street car system was installed in Mazatlan consisting of one open car seating about twenty-five people and drawn by two diminutive mules. This car service has been suspended and transportation about town is by means of two-wheeled carts called "Aranas" drawn by a small mule or horse. The tariff is \$1.00 an hour Mex. or 60 cents American gold. Another common means of transportation is an open carriage or barouche drawn by two mules or horses. The charge is about double that of the carts, but they are very comfortable. Up to about thirty days ago there were very few automobiles in the city of Mazatlan, although the population was formerly about thirty thousand and is now about fifteen or sixteen thousand. A fleet of eight Ford automobiles was purchased by one man and when delivery was made about thirty days ago, they were placed in rent service. These machines seem to be popular and many of the natives are enjoying their first rides in automobiles. There are now probably fifteen automobiles in the city and an exceptional opportunity exists here for a garage (there being nothing of the kind here at the present time) carrying a complete line of supplies and the agency for a cheap automobile together with one of a higher grade. Streets and roads are very poor and narrow, but among certain classes there seems to be plenty of money for luxuries, as they look upon the automobile now.

If one is willing to risk his judgment as to the stableness of the present Mexican government there are opportunities for investment in Mazatlan and vicinity for residential lighting. Service is good and the only reason for the limited use is lack of aggressiveness on the part of those who hold this concession. The electric light plant offers another opportunity. There are evidences that electric light and power was used quite generally before the revolution. The service, now, however, is very poor and many services have been disconnected. The electric light plant is not in the best of repair and funds are lacking with which to make needed improvements, primarily because, as the manager of the plant stated to me, a large majority of the consumers have not paid their bills for over two years. This condition, however, is rapidly changing and if this plant were in the hands of some real live energetic American, who knew what service meant and would make the needed improvements in order to put the plant in shape to give uninterrupted service, it could be made a very profitable utility.

The traction situation offers still another opening. The railroad station is about two or three kilometers from the center of town, and all rail freight, of which there is a great deal, could undoubtedly be handled in connection with passenger business. It now costs \$1.00 gold to ride from the center of town to the station and return. Freight is delivered to the business houses in mule carts and is expensive. Among other commercial lines there are also opportunities, particularly for the specialist. Business of all kinds is done very differently from our method. To be successful here, one must conform to the customs, must take life very slowly and easily, must open negotiations today and

complete next week, what would ordinarily be done in a few hours in the United States.

Even though peace reigns in this section of Mexico, I would not advise the investment of American capital in these enterprises without very careful investigation and some assurance from our own government that such investment would be protected. The Mexican government is new and while the opinion prevails here that its purpose and objects are sincere, there is still a lack of confidence that is noticeable.

ENGINEERING NOTES FROM PERU

One of the principal industries in Peru is undoubtedly the production of copper, and the largest producer in that country is the Cerro de Pasco Mining Company, with offices in Lima and New York, and with mines located 200 to 400 kilometers from Lima, Peru, up on the Andes Mountains, all of which are located above 14,000 ft. elevation. When this high elevation is considered it will not be hard to realize the difficulties connected with the mining of the ore. The fuel cost is necessarily high, as a good deal of what is used in mining and smelting the ore is brought up from sea level. Lifting the weight of the fuel through this distance requires much power, and is therefore expensive. Another item that goes to make up the total cost of production is the cost of labor and superintendence. That this item is particularly high in this case is also due to the high altitude, as good men must be paid yearly twice as much as they could expect to get in other localities more adapted to their constitution. Then, too, it is not possible for a white man to work as hard up in the rarified air as he can at sea level. The Indians who have lived up there for generations, of course feel at home in the air as it is, and can physically stand the hard labor, although by inclination they do not do it if they can help it. These Indians are built to suit the place. They have a chest twice the size of an ordinary man who has lived at sea level all his life, and it is said that if they go down to sea level, where they have no use for their big lungs they are very liable to get consumption.

ELECTRICAL OUTLOOK IN JAPAN

According to an article by Chugo Ohira in The New York Evening Post, it was only until recently that electric power in Japan has been used largely for the purpose of lighting and running tramways, its use as motor power in general industries being seldom employed. But in the last few years, especially 1916, the cheapness of electric motor power in comparison with coal, and the impetus given as a result of the European war to Japanese industries in general, have brought about a great change and at the end of last year various industrial enterprises were utilizing in their plants 600,000 kilowatt motor power. Most conspicuous, however, is the phenomenal progress made in the electro-chemical industry. From 28,000 kilowatts, which constituted the total power used for chemical enterprises at the end of 1915, the figure jumped, in the course of a year, to 58,000 kilowatts. And the future is very bright; the authoritative estimate tells us that should one take into account the enterprises under way and in contemplation, the total would be more than 160,000 kilowatts.

RECENT ADVANCES IN WESTERN WATER LAW

BY A. E. CHANDLER

(Riparian rights or the water rights of owners of lands bordering streams, lakes and rivers throughout the West have caused endless litigation and in countless instances the development of a whole district has been thwarted by the exercise of these rights. To such an extent has this been true most authorities today agree that it would have been far better in the beginning of things had these landed owners been allowed to possess no right in the waters due solely to the chance location of their property on valuable waters throughout the West. Here is an article by a member of the California Water Commission which speaks authoritatively on recent cases and statutes that relate to this perplexing question of riparian rights.—The Editor.)

RECENT CASES AND STATUTES RELATING TO RIPARIAN RIGHTS

BY A. E. CHANDLER

Since 1905 various attempts have been made in the State of Washington to secure the passage of a "modern water code" in line with such legislation in other Western States. Prior to the 1915 Legislature a commission of seventeen, appointed by the Governor and representative of the entire state, drafted a bill which failed to pass. The bill was reintroduced at the 1917 session and in an amended form has become a law. The principal amendments were in regard to the provisions of the bill affecting riparian rights, as the commission's bill practically abrogated the doctrine of riparian rights so far as future use is concerned. As passed, the only reference to riparian rights is the following from section one: "Nothing contained in this act shall be construed to lessen, enlarge, or modify the existing rights of any riparian owner * * *."

Longmire v. Yakima Highlands Irr. & Land Co.
Washington, 163 Pac. 782.

The Supreme Court of Washington has closely followed the Supreme Court of California in its decisions on riparian rights. The Longmire case deals with the vital question of the right to store flood waters for use in irrigating non-riparian lands when in conflict with riparian owners. The defendant was constructing a reservoir to impound the flood waters of Wenas Creek, on the east slope of the Cascade Mountains in Washington. Below the reservoir site the creek flows between low banks through a narrow, level valley. The floods occur from February to May and the valley lands are usually overflowed and sediment deposited upon them. During some years the creek does not overflow but does rise sufficiently to flow through natural depressions extending from the creek in various directions through the riparian lands.

The defendant tried to distinguish its case from *Still v. Palouse Irrigation and Power Co.*, 64 Wash. 606, 117 Pac. 466, which case follows the rule laid down in California in *Miller & Lux v. Madera Canal Co.*, 155 Cal. 59 (holding that the riparian owner is entitled to restrain any diversion which will deprive him of the customary flow which is or may be beneficial to his land and that he is not limited to any degree of reasonableness). An effort was also made to have the California case of *Gallatin v. Corning Irrig. Co.*, 163 Cal. 405, 126 Pac. 864, followed, and the rule applied that the flood waters could be diverted for use on non-riparian lands where they were of no sub-

stantial benefit to the riparian owner. The trial court, however, found that the annual impounding of water would diminish the water flowing onto the lands of the riparian owners approximately in the amount impounded and would work substantial damage by diminishing the lateral subirrigation and the fertilizing of such lands. As the Supreme Court felt obligated to accept the finding on the evidence presented, the Gallatin case was distinguished, the Still case followed and the storage enjoined. It is therefore clear that the way of the appropriator in Washington is hardly less free from conflict with riparian owners than in California, except that the tendency is far more pronounced in California to hold that the riparian owner may restrain any diversion by an appropriator **without showing damage**, upon the broad doctrine that the taking itself is an interference with his free-hold which he is entitled to restrain lest it ripen into a prescriptive right. In the Longmire case the Washington Supreme Court specifically holds that the controlling question is whether the impounding of the flood waters would work a substantial injury to the lower riparian owners.

The Hawson Bill

The 1917 California Legislature passed a measure, generally known as the Hawson Bill, which should materially assist appropriators in injunction cases brought by riparian owners. The act provides that in an action brought by a riparian owner to enjoin the diversion or use of water by an appropriator, the latter may set up in his answer that the water is for the irrigation of land or other public use and also set forth the amount to be diverted, nature, place and time of use and show by reference to the discharge of the stream that the proposed diversion may be made without interfering with the actual and necessary uses of the plaintiff. The answer must also state that the defendant desires the court to ascertain and fix the damages, if any, that will result to the plaintiff or to his riparian lands from the diversion. The act further provides certain details regarding the trial and appeal, if desired, after which upon the acceptance by plaintiff "of such amount so awarded or upon the affirmation of such decision on appeal so that such judgment shall become final, the defendant shall have the right to divert and appropriate from such stream, against such plaintiff and his successors in interest, the quantity of water therein adjudged and allowed."

Half Moon Bay Land Co. v. Cowell (Cal.), 160 Pac. 675

It is apparent from the above that the question of the limits of riparian land is an important one. The

generally accepted rule is that lands to be considered riparian to a stream must be within its watershed. From this it is often argued that lands cannot be riparian to a stream unless they drain into it. The Half Moon Bay case deals with San Vicente Creek in San Mateo County, California. The defendants argued that a certain tract was not riparian because its slope was such as to carry water away from the stream. The land in question lies in the flat territory bordering upon and with a general slope towards the ocean. The court called attention to the fact that in delta land situated near the mouth of a stream the water in the stream is often higher than the adjacent land, and said: "It would be an extremely unwise and unjust adherence to a supposed rule to declare that land thus made to slope away from the stream is thereby deprived of the riparian character and rights."

The Half Moon Bay case is also noteworthy for its enumeration of the points to be considered in deciding upon a reasonable apportionment among riparian owners, as each riparian owner is entitled to a reasonable use of the waters of the stream. No comprehensive rule has ever been laid down, as it is held that the concrete facts presented by each case must be separately weighed. The points to be considered include the length of the stream, the volume of water in it, the extent of each ownership along the banks, the character of the soil owned by each contestant, the area sought to be irrigated by each, the practicability of irrigation of the lands of the respective parties, the expense thereof and the comparative profit of the different uses which could be made of the water on the land. It is held in this case "that when the water is insufficient for all the land or for all of the uses to which it might be applied thereon, and there is enough only for that use which is most valuable and profitable, the shares may properly be limited to and measured by the quantity sufficient for that use, and the proportions fixed accordingly." On account of the steep hillsides involved in the case, the trial court found only a small portion of the riparian lands were suitable for profitable irrigation, and the finding was upheld.

This case also emphasizes the rule that a riparian owner who is not using his share of the waters of a stream has no right to object to its use by another riparian owner on riparian land.

Horst Company v. Tarr Mining Co., 53 Cal. Dec. 229

Under the caption "Loss of Water Rights" published in the issue of the Journal of May 4, 1912, the present writer stated that he believed that the current idea that an appropriator by diversion and use for five years secures an absolute right as against lower riparian owners was erroneous. This statement was based upon decisions of the California Supreme Court made at that time indicating that the diversion by an appropriator will be allowed in all cases where injury, either present or future, would not be done to riparian owners. As one of the basic factors of an adverse right is that such right must be used to the damage of the one against whom it accrues, it was believed that a diversion which did not directly damage the riparian owner could not be considered adverse. The Horst Company case clearly shows, however, that the "current view" is the correct one.

In this case the lower riparian owners attempted to enjoin the upper appropriators, who had been diverting the waters of Bear River for upwards of fifty years, on the grounds that the diversion had only recently and within five years of the initiation of the suit deprived the riparian owners of the natural flow of the stream. The court held, however, that the plaintiffs were entitled to the full flow of the stream by their lands at all times and that any taking above to non-riparian lands was an invasion of their rights, whether they used the water or not, and regardless of the fact that the water remaining in the stream may have been sufficient for their needs and uses. The diversion for five years, therefore, gave the appropriators "a perfect title in fee, good against all lower riparian proprietors * * *." The case is especially strong on this point, as the plaintiffs claimed that the defendants in former years had brought from other sources and emptied into Wolf Creek, a branch of the Bear River, water equivalent in amount to that diverted from the main stream and that for this reason the natural flow of the stream at plaintiff's land was unaffected.

NOTES ON RECLAIMING ALKALI LAND BY ELECTRICAL PUMPING AND OTHER METHODS

In expressing an opinion for the Journal of Electricity on the recent drawing of the Kearney Vineyard by means of electrical pumps and other methods employed by the University authorities, Professor S. T. Harding of the civil engineering department of the University thus compares the various methods:

The saving in power requirements would hardly seem to be sufficient to warrant the additional construction cost of the tile drains under the conditions existing in this area. The tile drainage method has, however, been demonstrated to be successful in restoring the land to productivity. The sump method has not been used sufficiently to demonstrate its effectiveness on a large scale, although a development such as that outlined by Mr. Hill should be successful in lowering the ground water below the point of injury. Mr. Weir recommends lateral drains 400 ft. apart and 7 ft. deep. A sump drawing the water to a depth of 30 ft. would drain 200 acres if it lowered the water over a radius of about 1/3 of a mile.

A noticeable feature of both methods is the character and amount of the power load of such plants. The Kearney vineyard plant is equivalent to 1 horsepower for each 20 acres drained, the load factor for a six months' season being nearly ninety. The sump method using 15 horsepower per plant is equivalent to 1 horsepower for each 13 acres drained if a plant is used for each 200 acres. The sump plants would have a similarly high load factor.

These methods illustrate the possibilities of drainage by means of pumps in areas having small slope where gravity outlets can not be economically secured. The tile drainage method can be adapted to all types of soil. The sump method is suited to those more open soils where the effect of the drawdown at the sump will extend over a relatively large area, a condition which is found in this area.

SUGGESTIONS FOR CONTRACTOR AND DEALER

DEPARTMENT CONDUCTED BY GEORGE A SCHNEIDER

(Service is the watchword of the hour these momentous days in our national life. Here is a discussion that tells how better service will make for better success in the contractor-dealer's experience. Technical hints on direction of air flow from ceiling fans, notes on wiring diagrams and a discussion on the standard direction of rotation for electrical machinery follow—all of which should prove helpful. The author is power apparatus specialist for a well-known electrical supply house in San Francisco in which position he is constantly employed in solving just such problems as these.—The Editor.)

SERVICE.

In these days of big business, we hear a great deal about service. Business philosophers preach it,—salesmen talk it,—advertising men write about it. In fact just now it seems to be one of the most-used and perhaps least—understood terms which passes between buyer and seller. It is almost in the same category with the hackneyed word "efficiency." But good service is an essential requisite to a successful business—be it large or small. It is therefore a broad subject—one about which volumes could be and have been written—so a detailed discussion could not possibly be attempted in these columns.

However, there is just one point we wish to bring out. This is that very often the buyer takes for granted that the matter of good service in connection with any business transaction rests entirely with the seller and if the service is not satisfactory, the seller, not the buyer is at fault. An analysis of a number of complaints or comments about service will usually show this is not the case and that the question of good service quite frequently depends upon the acts of both buyer and seller.

We can easily justify these assertions by a consideration of one or two common problems likely to be encountered almost daily in any large business house. Take for example the matter of correspondence. Carelessness in writing letters or orders is closely interlinked with poor service—in fact one is almost the complement of the other. It is really surprising to note how many business letters are improperly written and how many fail to convey the thought their writer wished to expressed. Also how many are incorrectly addressed and therefore, often delayed.

Many persons are in the habit of writing about several different subjects in the same letter. In a large business house such a letter would need to have the attention of several departments. Hence the chance for delay in answering. Again letters are so addressed that it is difficult to tell whether they are personal or business. Such methods may likewise delay prompt replies. To secure prompt attention letters should be addressed to the firm for which they are intended. If, however, the letter is intended for any particular person in the firm, and is business, his name should appear as a sub-address or the letter should be marked for the attention of that individual. Then again if there has been previous correspondence on the subject, reference should be made to it. This is often omitted. Just the day this article was written the writer saw a letter addressed to a large manufacturing concern which read, "Reply to our letter of

the 8th." This came from a good sized firm. It is easy to see how such a letter could cause considerable delay in handling the transaction to which it referred and therefore results in what we would probably call "poor service."

So it is with telegrams. Many of them are simply a waste of time and money, because so often they are incomplete or carelessly written. In the desire to hasten matters and save time, the essential details are frequently omitted. This is well illustrated by the following telegram received by the writer some months ago. "Your house advertises overnight shipments. See what you can do with this order. Send me two one-horsepower motors." It is needless to say that this order was not completed without the delay needed to secure more specific requirements from the customer.

Hundreds of similar instances could be easily enumerated by almost any observing person with a few years' business experience, for these are not uncommon but they are sufficient to illustrate the point we wanted to bring out. Similar analysis of many other factors of business will also show that good service depends upon both buyer and seller.

On account of the technical nature of the electrical industry, more care is required to give satisfactory service than in some other fields of business, but the rewards for improvement are also greater.

DIRECTION OF AIR FLOW FROM CEILING FANS

Standard types of ceiling fans have the blades set to throw the air downward but if desired the blades can be arranged to draw the air upward toward the ceiling, that is, the direction of air flow can be reversed. This arrangement permits a general circulation of air without the direct breeze being felt and is convenient in places where papers are to be handled, such as in offices and banks. The upward draft of the fan will ordinarily not be sufficient to disturb the papers. This scheme is also employed to keep flies from gathering on the ceiling.

To make this change it is necessary to use left-hand blade holders or castings. It cannot be done by simply reversing the standard blades and castings. Most manufacturers furnish these special castings without extra charge in place of the regular ones.

It is also possible to secure ceiling fans with adjustable blade features. With this arrangement the position of the blades can be changed at will, so that the air can be directed downward or upward to any degree and by adjusting the blades so they are flat no air will be moved. Fans equipped in this way are par-

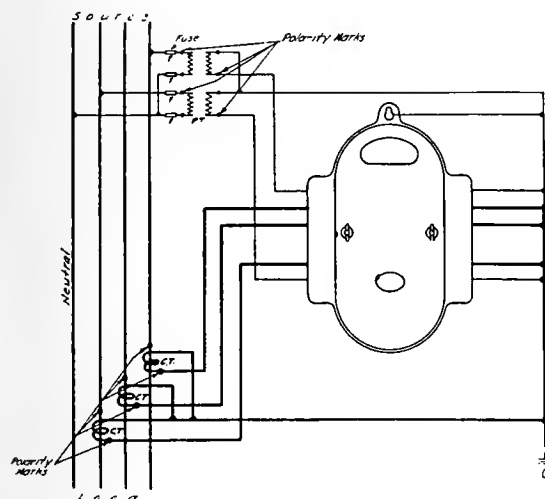
ticularly adaptable for certain installations where good circulation is necessary. As an example, an installation of these fans in a large assembly hall may be arranged so that the air flow can be controlled and so directed as to maintain a constant circulation of air by having the fans in the rear of the hall draw the air upward and those in the front of the hall throw it downward.

Careful consideration of these points will quite often eliminate objections against ceiling fans or help to correct existing installations that are not giving satisfactory results.

NOTES ON WIRING DIAGRAMS

An old custom which is still followed out by many persons is that of indicating the crossing of a wire over another wire in a connection diagram by means of a loop or semi-circle. In the modern diagram this loop is entirely eliminated but dots are placed at the connection points between wires. Carrying out this scheme gives a much neater and more easily read diagram—also one that is more quickly drawn. This is especially so in connection with apparatus involving a large number of wires or when connections between several devices or a complete system are shown. Earlier diagrams drawn along the old ideas were quite complicated.

A modern diagram constructed in accordance with modern practice is shown by the accompanying figure.



Example of Modern Connection Diagram

This diagram is symmetrically drawn and very easily followed. This figure also illustrates another practice which is now being generally adopted by the various manufacturers as new literature is printed—that of including polarity marks for current and potential transformers or other similar devices on all connection prints. These marks on the diagrams correspond to the polarity marks on the transformers which are usually indicated in red color painted on or near one primary and one secondary terminal.

When using some types of alternating current instruments such as wattmeters, power-factor meters and synchroscopes it is essential that they be connected into the circuit with proper regard to the polarity of the transformer terminals. If this is not done, wattmeters may be reversed; or, in case of polyphase wattmeters and power-factor meters, erroneous and

misleading indications may be obtained. By comparing the actual marks on the transformers with those on the diagrams the correct connections are easily made. This is an improvement over the old cut and try method of the days when this practice was not in vogue. It will be noted also that the current windings in this diagram are drawn much heavier than the potential circuits to further assist in distinguishing them.

These facts while being of most interest to those doing actual construction work also serve well to indicate how completely the electrical industry, even to the minor details—is being standardized.

STANDARD DIRECTION OF ROTATION FOR ELECTRICAL MACHINERY

The general engineering recommendations of The Electric Power Club include a suggested standard direction of rotation for electrical machinery which is now generally accepted and followed by the manufacturers of such apparatus. Section 5401 in the book of standards issued by the organization under date of February 1, 1917, covers this particular point. It reads as follows: "The standard direction of rotation for all non-reversing direct current motors and single-phase motors shall be counter clock-wise, and for all alternating current and direct current generators shall be clockwise viewed from the end of the machine opposite drive. Unless otherwise specified, standard machines will be connected for standard direction of rotation."

It is always well to check the direction of rotation desired with these standards especially when machines are to be ordered from the factory and built to order. At the factory it is far easier to assemble for a given rotation than on the job and very often by so doing considerable time and expense is saved during erection. Of course the manufacturer cannot be expected to make any changes in apparatus that has been built for stock as this would involve uncrating, re-assembling and re-testing in accordance with the standard factory routine which would be quite expensive and undesirable for other reasons.

Alternating current generators and motors of the most common types are easily changed to operate in a different direction of rotation. Generally this requires only changing the collector-ring brush holders and in some cases even this is not done, depending upon the design. With direct current apparatus having a large number of brushes, however, the job is not so easily completed, especially in machines of the commutating-pole type, which are somewhat more difficult to change than the older machines not having these features.

Engine type generators—either direct or alternating current—are always assembled for the correct rotation at the factory, the direction being chosen by agreement with the engine builder.

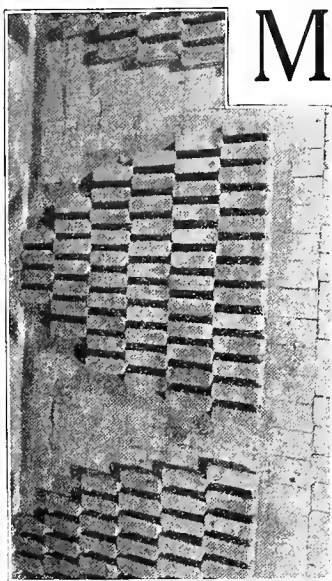
When direct-connected exciters form part of engine-type alternator installations their direction of rotation will be set at the factory. However, when belted-type exciters are to be used the direction of rotation should be considered when ordering as this could not be determined by the factory unless plans of the proposed installation are included with the order. The direction of rotation will depend upon the position of the exciter with reference to the exciter driving pulley on the alternator.

FUEL OIL AND STEAM ENGINEERING

(The "how" and the "why" of steam generation in the boiler when fuel oil is burned beneath it are fundamentals necessary to be understood before intricate details in design are considered. In this article the authors first treat of the fundamental principles of the boiler itself and then follow with an elementary discussion of furnace operation. By means of the ground work thus laid, this elementary treatment in later articles is to be broadened out into a discussion of the important points in the design and operation of the modern steam boiler, oil fired.—The Editor.)

THE FUNDAMENTALS OF FURNACE OPERATION IN FUEL OIL PRACTICE

BY ROBERT SIBLEY AND CHAS. H. DELANY



Air Ducts for Furnace Floor

MANY of us are familiar with the famous painting that pictures James Watt as a boy gazing in wide-eyed amazement at the homely tea-kettle spouting forth its hitherto unharnessed power generating vapors. The eyes of the youth are illuminated with that strange and wonderful light that set forth in a measure some of the dreams of constructive imagination which must have been filling his consciousness at that time.

The great inventor of the steam engine undoubtedly saw in the tea-kettle before him, not the homely object of the kitchen,

but in its expanded form one of the most necessary mechanisms for modern industrial development—namely, the steam boiler.

Let us then examine the fundamental operation and construction of the steam boiler, and consider this great giant of modern industrial aggrandizement to see wherein it varies from its progenitor—the homely tea-kettle of Watt's boyhood dream.

The Fundamentals of the Tea-Kettle and the Boiler are the Same.—The tea-kettle in its construction

and operation may be considered under three separate discussions. First, there must be some means of generating and imparting heat; secondly, a container for the water and steam must be constructed with physical characteristics to meet the stresses and strains involved; and, thirdly, the cycle of physical operations through which the water and steam pass in the generation of steam is of vast importance.

The tea-kettle operation in its simplest analysis consists of a flame placed beneath a metal container.

This metal container absorbs the heat from the flame and transmits it to the water within the container. When sufficient heat has been absorbed by the water within the container to raise its temperature to the boiling point corresponding to the external pressure of the atmosphere, the tea-kettle boils or in the language of the steam engineer the tea-kettle generates steam.

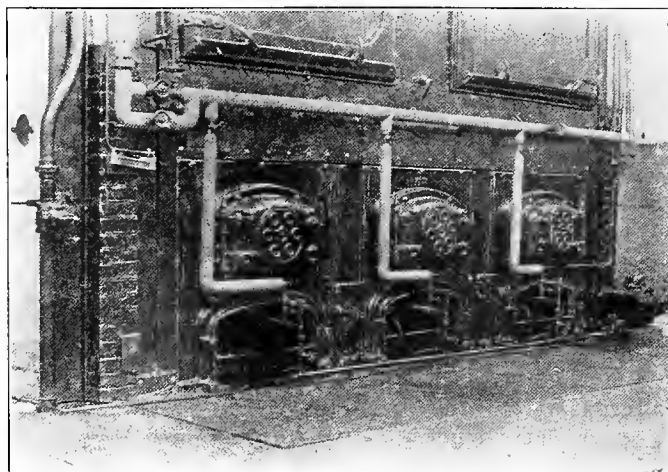
In its fundamental makeup, the boiler too, quite closely follows this familiar and homely object—the tea-kettle. For in the modern boiler heat is first generated in a furnace. This heat is then imparted to a metallic drum or tubes through which water is passed. When sufficient heat is thus imparted to raise the temperature of the water to the boiling point for the pressure involved, steam generation takes place.

Inefficiency of Tea Kettle Operation.—In modern kitchen economics but little attention is paid to the manner in which the heat is imparted to the tea-kettle. Usually the stove lid is taken off and the kettle placed over the fire space thus created. Some minutes later, the house-wife, ignorant of the vast heat losses that have taken place, returns to draw off the hot water thus inefficiently obtained as convenience may require. As a matter of fact, the slightest and most casual investigation shows that in the United States millions of dollars are wasted every year for lack of reasonable care in the kettle operation. This loss is, however, so widely distributed over thousands of homes that it is not felt in any concentrated form.

Efficiency in the Modern Steam Boiler a Necessity. In the case of the modern central station, however, efficiency is the cry of the day. For with competition on all sides and regulating commissions to limit the prices charged for the power supply, the utmost in economic steam generation is essential.

Hence, in modern steam boiler operation, especially in its heat generating properties, a wide variation from tea-kettle operation is in vogue, not so much in fundamental principles involved as in efficiency of methods employed in the heat generating mechanisms.

Efficient Furnace Construction of Utmost Importance.—To accomplish this efficiency an enclosed compartment beneath the boiler proper is built. This is known as the furnace. In this furnace heat gener-



TYPICAL BOILER FRONT IN FUEL OIL PRACTICE

In this illustration may be seen the fuel oil atomizer in the ash pit entrance, the hooded steam pipes for supplying steam used in atomization, the fuel oil supply pipes, the damper control, the draft gauge and other accessories for fuel oil operation.

ating substances such as coal, wood, and crude petroleum are burned. In the study of chemistry it has been found that certain primary elements, notably carbon, hydrogen, and sulphur, upon coming in contact with heated oxygen undergo a chemical reaction and in doing so give out enormous quantities of heat. It is the generation of this heat and its ultimate absorption by the water in the boiler that makes the modern steam engine and steam turbine the giants in commercial enterprise that today they represent.

Fuels Defined.—In nature, substances such as coal, wood and crude petroleum are found in vast quantities and since these contain large amounts of free carbon and hydrogen, they make excellent articles for heat generation and are called fuels.

An Air Supply Essential.—It has been mentioned that a supply of oxygen is absolutely necessary so that a chemical reaction may take place and thus liberate the heat held in suspense in the fuel. The air about us is made up of about twenty per cent oxygen and eighty per cent nitrogen. The nitrogen is an inert, valueless ingredient that must pass into the furnace, absorb some of its heat and go out through the chimney, thus conducting away into the outer atmosphere some of the heat generated. The oxygen, however, upon coming in contact with the heated carbon, hydrogen, and sulphur of the fuel, readily chemically reacts with them.

Enormous quantities of heat are thus liberated, later to be absorbed by the water of the boiler, eventually to produce the steam delivered for the driving of the steam engine or the steam turbine.

Furnace Operation.—Since this series of articles

is largely concerned with fuel oil practice, let us briefly outline the furnace operation for such practice. In a later chapter this will be taken up in more detail.

The Fuel Oil Burner and Its Function.—The fuel oil is sprayed into the furnace by means of an atomizer or burner which pulverizes the oil and delivers it in a gaseous vapor or in small globules at the hottest place in the furnace. Air is admitted from below and as soon as the temperature is raised to the ignition point chemical reaction takes place with the atomized fuel oil, and thus heat is generated. This heat is absorbed by the gases of the furnace and consequently their temperature is at once raised often times to 2300 deg. or 2500 deg. F. These furnace gases consist of the inert nitrogen that partly constituted the entering air, the

carbon dioxide or carbon monoxide formed by the burning of the carbon, water vapor formed by the burning of the hydrogen, sulphur dioxide formed by the burning of the sulphur content, which latter ingredient is always small, and a considerable quantity of free oxygen depending on the amount of excess air admitted to the furnace.

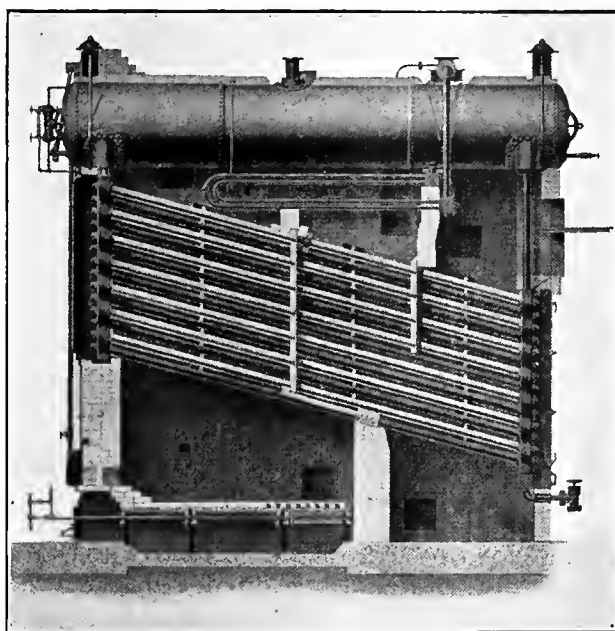
The Path of the Furnace Gases.—In their expanded condition, due to the absorption of such huge quantities of heat, the gases now travel upward. As they come in contact with the boiler drums or tubes through which water is circulating, the gases are, of course, cooled and the temperature of the water raised. In this manner the gases, having been chilled or lowered in temperature to 500 deg. or 600 deg. F., are finally passed up through the chimney, and steam generation within the boiler is accomplished.

The Economizer and Its Economic Value.—In some boiler installations a series of tubes through which cold water is passing, are placed between the boiler and the chimney. The chimney gases are thus forced to give up still more of their heat. These outgoing chimney gases are consequently reduced still further in temperature.

Such a device, as cited above, is known as an economizer. This reduction in the temperature of the outgoing chimney gases reduces the draft of the chimney. Hence, the economizer is an economic success so long as the saving in feed-water heating is greater than the interest on the cost of the economizer installation and other apparatus necessary to produce artificial draft, plus the cost of maintenance of this additional apparatus.

Quantity of Air Required—It has been observed that the entrance of air into the furnace is absolutely essential for furnace operations. Too much air, however, is detrimental, for more oxygen may be admitted than can be economically used by the fuel. Hence, too great an excess of air simply means the passage up through the chimney of excess gases which absorb heat only to convey it out into the atmosphere without performing a useful function. In successful boiler operation, therefore, some means must be provided, first to measure the draft; second, to test the ingredients of the outgoing gases; and third, to regulate the entrance of air into the furnace.

The Draft Gage and Its Principle of Operation.—A draft gage usually consists of a column of water placed in a U-tube. The pressure in the chimney is



CROSS-SECTIONAL VIEW FOR AN OIL FIRED BOILER

Here may be seen the steam drum, the water tubes, the superheater, the furnace and the atomizer. In this type, which is known as the "back shot," the fuel oil is sprayed from the rear toward the front. The heated gases then travel up around the water tubes and by means of the baffles are forced to zigzag down and up again around the water tubes, finally passing out at the rear of the boiler setting. The air and oil supply are controlled by the operator from the front as shown.

less than the atmosphere without. Therefore, if one end of this tube is inserted into the chimney and the other rests under the atmospheric pressure without, the difference of water level thus obtained in the U-tube indicates the draft in inches of water. This may be converted into pounds pressure (absolute) per square inch by applying the formulas previously set forth in the chapter on pressures.

Apparatus for Determining Ingredients of Outgoing Chimney Gases.—For economic boiler operation the steam engineer should know the exact composition of the outgoing chimney gases. Since this is a matter of vast importance a later chapter will be given in which detailed discussions of methods involved and apparatus employed will be given. Suffice it to say at this point, however, that by means of such apparatus the engineer may determine whether the fuel is being properly consumed in the furnace and whether too little or too much air is being admitted into the furnace.

Draft Regulating Devices.—In fuel oil practice the proper supply of air may be determined to a nicety. Hence some means must be provided to regulate the air supply with the same precision. This is done by varying the amount of opening of either the ash pit doors or the boiler damper or both. If the air is regulated by partly closing the ash pit doors and leaving the damper wide open a strong draft may occur inside the boiler setting which tends to draw air in through the brick walls. As this is a detriment it is preferable to regulate the air by means of the damper.

The Chimney.—After the gases have passed through and around the various heat absorbing tubes and drums employed in the modern steam boiler and economizer they are shot up into the atmosphere through a long vertical passage. The structure housing this passage is known as a chimney. The height of the chimney and its area of cross-section through which the flue gases pass have an important bearing on the economic boiler or rather furnace operation. This is of such importance that it will be the subject matter for a later discussion.

In a general way, the reader now has a grasp of the fundamentals involved in modern furnace operation for the steam boiler. We shall next consider the container or shell for steam generation and its accessories.

POLES PURCHASED FROM THE FOREST SERVICE

The Forest Service, through its Office of Industrial Investigations, has compiled statistics on the number of poles purchased during 1915 in the United States by the telephone and telegraph companies, steam and electric railroads, and electric light, heat, and power companies. The census was taken exclusively by correspondence with approximately 17,000 purchasers, representing practically all the pole users in the country. About 12,000 concerns returned schedules in reply to either the first or the second request for data.

Table I.—Poles Purchased, by Kind of Wood, 1907 to 1911 and 1915

Kind of Wood.	1915	1911	1910	1909	1908	1907
All kinds	4,077,964	3,418,020	3,870,694	3,738,740	3,249,154	3,283,268
Cedar...	2,521,769	2,100,144	2,431,567	2,439,825	2,200,139	2,109,477
Chestnut.	651,643	693,489	677,517	608,066	516,049	630,282
Pine....	546,233	161,690	184,677	179,586	116,749	155,960
Oak.....	199,442	199,590	263,290	236,842	160,702	76,150
Cypress.	67,644	72,995	75,459	77,677	90,579	100,368
All other	91,233	190,112	236,184	196,744	164,936	210,731

HYDROELECTRIC DEVELOPMENT IN GERMANY

Among the many articles recently written about the utilization of Germany's internal resources, more particularly about the state's share in the promotion of electrical enterprises, is one which appeared in the December 6, 1916, issue of the financial review "Plutus." It is from the pen of Herr Wilhelm Beck, of Steglitz, and gives interesting facts regarding electrical development.

The use of electricity for illumination and power has made remarkable progress during the past three decades. In 1886, statistics show, there were 11,500 arc and 165,000 incandescent lamps in Germany. To-day, according to the latest figures, about 4200 power plants are supplying 18,000 communities with electrical current. It is possible for three-quarters of Germany's population to obtain electric power. A quarter of a million arc and more than 25,000,000 incandescent lamps are now in use. The number of stationary motors exceeds 500,000, and they receive a total of about 2,000,000 horsepower. The number of kilowatt hours furnished has increased by 55 per cent in only two years. These figures indicate the general importance of electricity for the German nation.

The oldest electrical plants operated with a continuous current of low tension. Their efficiency was small, and the area that they supplied was limited because of the use of expensive copper conductors. Only since the introduction of a high tension alternating current and a cheaper system of conduction has it been possible to enlarge the area. From the single plant was developed the block station for a residence or other city section, and finally the central station for an entire city. The area was still further enlarged by scale, to local power stations, which in turn will districts and Provinces with electric current.

The evolution is now entering a new stage of centralization. In the future the current will be supplied by long distance power stations, constructed on a large scale of local power stations, which in turn will distribute it to the consumers. Electricity is becoming the common property of all. For many years only the city industries and traffic received the benefits of electrical production. Its utility for the rural districts was not generally perceived. The first step was taken by a few municipal electrical plants which extended the supply of current to the neighboring rural communities. In 1903 several farmers of a district united on a co-operative basis to construct an overland power plant.

It was formerly deemed a principle of political economy that an industry can thrive only where it obtains a large supply of the necessary raw materials—iron, wood, copper ore, earth for brickmaking, etc. Today it is believed that not only such materials are needed but also cheap sources of power for their manufacture. The most valuable of the latter are coal beds, water power, and peat bogs. The last mentioned are very extensive and important in this country. In coal mining Germany holds second place in Europe after England. The water power has been estimated at 1,500,000 h.p. About a quarter of this is already utilized, and large dams and reservoirs are being built.

SPARKS—Current Facts, Figures and Fancy

("Is America to be the railroad builder of the world?" and "What about electrification of railroads throughout the world?" These are some of the notations that are discussed in the following briefs that may serve to sow the seed of usefulness and constructive imagination in your quiet thought. The world is big and the opportunities never more grand than those ahead. Why should you not take a part in these stirring world problems?—The Editor.)

Secretary Lane estimates that there is undeveloped in the United States today something like thirty-five million water horsepower.

* * *

A well-known authority estimates that over a quarter of a billion tons of coal annually could be saved in haulage by developing the waterpowers of the nation to meet its present industrial development.

* * *

Electric-furnace heating has developed low temperature electrothermal processes that are wonders for the art since scientific adjustment and control are possible under this method that can not be approached under any other known procedure.

* * *

Crude petroleum in ever increasing prospects is being unearthed each month in Wyoming. Many thousands of tons of supplies for the oil fields were held up all winter, in Casper by inclement weather and the impassable condition of the roads.

* * *

The campaign for the household electrical proceeds unabated in eastern Washington. In the past five months the Washington Water Power Company has sold and installed four hundred ranges and four hundred water heaters. And the end is not yet.

* * *

Though an enemy army may never land on our shores, there is a powerful enemy already here who annually inflicts upon us damages totaling two hundred million dollars. That enemy is fire. Central stations and hydroelectric companies can do their share in reducing this huge loss.

* * *

Dense Douglas fir, such as is found in butt logs of this tree, which is very abundant on the Pacific Coast, is advocated for "treenails" for ships. "Treenails," or "trunnels," as they are commonly called, are cylindrical wooden pins, used in fastening the parts of wooden ships together.

* * *

For sanitary reasons school slates have not been in favor in many American and English cities for several years, but now that paper has become scarce and expensive there is a movement to return to the use of school slates, with due precautions. Perhaps the hydroelectric industry in the West may soon find an additional outlet of energy for this new industry.

* * *

American exports in May were valued at \$551,000,000, a gain of nearly \$21,000,000 over April, according to a statement issued by the Bureau of Foreign and Domestic Commerce of the Department of

Commerce. The total exports for the 12 months ended with May were valued at nearly \$6,183,000,000, the highest figure ever recorded for any one year.

* * *

Producers of crude oil in California declare that the production of petroleum in that state is declining at a very serious rate. Stocks of petroleum were drawn on last year to the extent of fifteen million barrels. It is said that over forty million barrels still remain in storage, which, if the same rate of decrease in production is maintained, will only last for another two years. It is feared that within a year the reserve will be so small that it will be necessary to hold shipments to the amount of production.

* * *

Is America to be the railroad builder for the world? An affirmative answer to this question seems not improbable in view of the reports that American engineers and material will soon be employed in the reconstruction of the transportation systems of Russia and of France, and that after the war it will be to this country that the nations of the globe will look for locomotives, cars, equipment and expert railroad men. And in addition world-wide electrification at American hands must inevitably follow.

* * *

— Contracts for two hundred thousand wind-proof shirts at \$2.52 each have been awarded by the Navy Department. These garments are part of the special uniform to be furnished American sailors on submarines, submarine chasers, destroyers, and other craft on which the men are greatly exposed. The uniforms were designed by the Bureau of Navigation of the Navy Department, and the contracts call for wind-strapped seams. It would seem that such garments as these might prove useful for employes of hydroelectric companies situated in the high mountains and other exposed places.

* * *

The production of coal in the United States last year, was the greatest in the history of the country. A new record, however, was set for the first six months of this year, fully 270,000,000 tons of bituminous coal being produced since January 1st, thus exceeding the output of the first six months of last year by about 20,000,000 tons. Even better news is that the limit has not yet been reached, for as the railroads are able to work out to better advantage the problem of car supply and give to the mines greater facilities for transporting their product to market, the supply of coal that reaches the consumer will be in steadily increasing quantities.

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CONTENTS

A New Advance in Fuel Oil Economy. <i>By C. D. Stewart.</i>	49
Costs of Electric Pumping Replacements of Gas Engines. <i>By Ross B. Mateer.</i>	52
Notes on Public Utility Rates. <i>By C. E. Grunsky.</i>	53
Night Views. <i>By C. B. Merrick.</i>	57
Safety Suggestions for Electric Appliances.	57
An Electrical Meteorological Station.	57
Bearing Currents in a Rotary Converter. <i>By L. J. Corbett.</i>	58
Gigantic Electrical Equipment for Cantonments.	59
Wireless Telephone Used by Navy in War.	59
"Doing-it-Electrically" in the Schools. <i>By Hoyt Catlin.</i>	60
The Electric Charging Station at Cristobal Terminal.	61
Electrification of Swiss Federal Railways.	61
The Selection of Heat Insulating Materials <i>By John Crawford, Jr.</i>	62
Present Day Engineering Problems in the West. <i>By J. E. Woodbridge, J. M. Barry, S. J. Lisberger, H. S. Warren, E. R. Northmore, R. E. Cunningham, C. O. Poole, J. E. Macdonald, J. S. Thompson, A. Bowie, D. T. Buits, H. A. Barre, L. M. Klauber, E. A. Quinn, W. J. Davis, P. M. Lincoln, J. A. Koontz, J. A. Lighthipe, P. M. Downing, R. J. C. Wood, S. P. Russell, G. C. Wood, Don Morgan, and J. G. Scrugham.</i>	65
Short Journeys in Pacific Lands.	72
Engineering and Commercial Activity on West Coast of Mexico. <i>By J. W. Finch.</i>	73
Engineering Notes from Peru.	73
Electrical Outlook in Japan.	73
Recent Rulings and Statutes on Riparian Water Rights. <i>By A. E. Chandler.</i>	74
Suggestions for Contractor and Dealer. <i>By George A. Schneider.</i>	76
The Fundamentals of Furnace Operation in Fuel Oil Practice. <i>By Robert Sibley and Chas. H. Delany.</i>	78
Sparks—Current Facts, Figures and Fancy.	81
Editorials	82
Personals	85
Trade Notes	86
New Bulletins	86
Book Review	86
Meeting Notices for Electrical Men.	87
Latest in Everything Electrical.	90
What Western Inventors are Doing.	93
New Electrical Developments.	94

TO THE MOTHERS OF ENGINEERS

As a leader in engineering thought of the great West, this Journal would be unmindful of its duty in these days of national stress did it not at this time call the attention of its readers to that patient, long-suffering, soul-inspiring group so dear to us all—the mothers of engineers. And when in the coming months the bravery and daring of a nation, backed by the genius of its engineers, shall gain that heaven of freedom for the democracy of the world, let us, with bowed heads give to the mothers of engineers, whence came so great a portion of the strength for this conflict, the credit where credit is due:

"When the soul of woman conquers
And God's banners are unfurled,
We will gain a glimpse of Heaven
From the hill-tops of the world."

Every indication points to the conclusion that the three coming conventions on the Pacific Coast—The Electrical Supply Jobbers at Del Monte, The Pacific Coast Gas Association at Santa Cruz, and The Northwest Electric Light & Power Association at Spokane—will be unusually well attended and that they will prove helpful to a degree never before realized in the engineering life of the West.

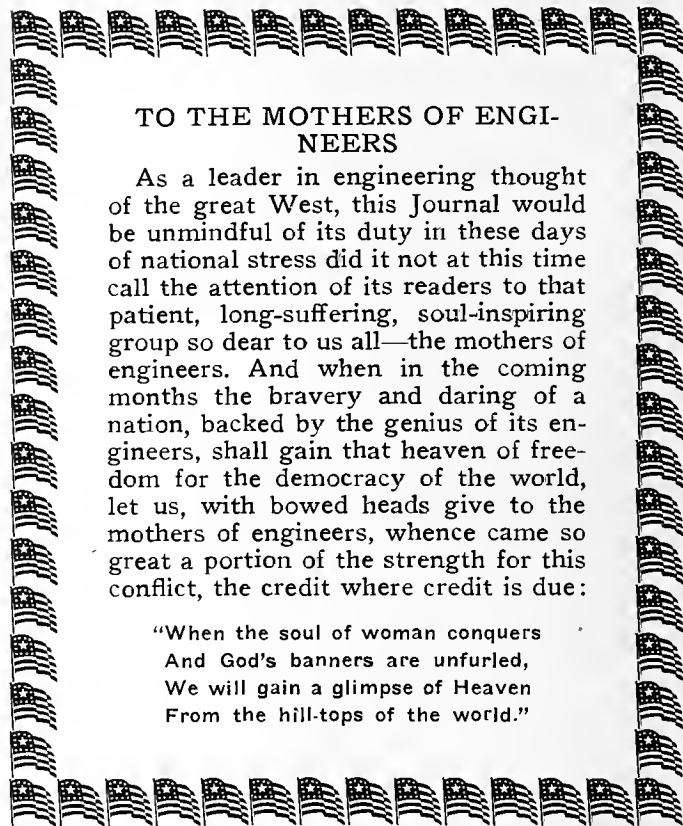
In times of national stress, it is right and proper that this should be true. If ever there was a necessity for co-operation and better mutual understandings and interchange of helpful ideas, this is the time.

Let us all, then, continue to bend every effort toward bringing these meetings to an unprecedented plane of helpfulness and thus aid again in furthering the successful consummation of the world task that is ahead.

In readjusting our mental perspective to meet the enlarged vision of world activity now before the nation, care must be exercised or many essential points for future efficiency are liable to be overlooked.

The demoralization of the status of engineering colleges—both in student and faculty organization—should be most carefully guarded against. While it is of course necessary that the gigantic potentiality of the nation be brought to bear in equipping armies and in provisioning ourselves and our allies, yet only short-sighted preparedness would say that we should overlook our possible status ten years from now.

Educators and engineers should, then, give deep and weighty consideration to the problem of maintain-



ing in our engineering schools the highest and most efficient training possible. And strength of numbers should not be overlooked. A deplorable state of affairs has been found among our allies who overlooked this vital point and today after a brief three years the young and vitalizing force of engineering talent is lacking.

Let us, then, see to it that the splendid technical and engineering laboratories in the universities and colleges of the nation remain filled with younger men in training and that the excellence of instruction be not allowed to depreciate.

There is nothing that creates a more lasting impression in the use of electrical energy than that gained by the school child in making for himself or herself some little piece of electrical apparatus that each can call his or her own.

The Education Electrical

Hundreds of mothers agree that some little hot drink is most beneficial for the child at noon when off at school for the day. To get a wholesome, inexpensive soup has been the long desired goal sought for, but disappointment in price or composition of the soup has been met with in practically every attempt.

On another page of this issue is a description of an electric soup cooker, simple in construction and inexpensive in operation that has been developed in the territory of the Pacific Power & Light Company in the Northwest. It is hard to estimate the educational value of such a device as this. The ingenuity of the child is given a chance to display itself and the usefulness of the article when made, has been tried and found to be of a high degree of excellence.

The education of the young in the method electrical is most important for the future expansion of the utilization of electrical energy. And that education in which the child can take a constructive part is the kind of educative campaign that is the most effective for permanency in results.

Central station managers and commercial agents throughout the West would do well to imitate this excellent campaign in the method electrical that has been so auspiciously inaugurated in the Northwest.

Activity looking toward further development of electrical energy in California is proceeding on a scale that has not been equaled for years. Although the power companies are doing everything within their control to follow out the ideas put forth by the State Council for Defense looking toward the conservation of fuel, still the saving accomplished is in no way meeting the increased demands for electrical energy.

Some conception of the proportions to which these new plans are daily growing may be gathered from a brief rehearsal of some of the work now under way in California. The Southern California Edison Company has a force of from one thousand to twelve hundred men working at Huntington Lake preparing to install a second unit of the giant Big Creek project. The Sierra & San Francisco Power Company is in-

stalling an additional 9000 kw. steam turbine in San Francisco. The San Joaquin Light & Power Company has recently completed a power plant of about six thousand k.w. and contemplates the immediate installation of an additional 15,000 kw. An extended enlargement in the long distance transmission system of the Southern Sierras Power Company is now under way, although this system is already the longest in the world. And finally as a closing citation may be mentioned the work of the Pacific Gas & Electric Company. Not content with its recent installment of 25,000 kw. put in from the Wise & Halsey plants, this company contemplates an additional 5000 kw. at the Spaulding Dam and, upon the Pit River in the north, an additional 150,000 kw. is being undertaken which will double the output of the company's present eleven hydroelectric plants combined.

Such work as this speaks well for the industrial development of California and means much for permanency in prosperity now felt throughout the confines of this commonwealth. The wheels of industry, set going by means of water power development, will turn forever and neither war nor age can effect the eternal source from which they draw their supply.

As these lines go to press the nation is preparing to call to the colors the first five hundred thousand stalwarts that are to be the vanguard of the new vast army which is to assist in spreading the gospel of liberty and democracy throughout the world.

False Pride and Patriotism

To keep this army in the highest state of efficiency it must be remembered that another vast array of men will be necessary in the industrial channels of the nation.

Much has already been said about getting the wrong man in the wrong place—especially men trained in industrial life that years of preparation have been necessary to bring to a high standard of efficiency.

Attention is especially called at this time to a sense of false pride that is liable to overcome the younger man, which to him may appear not in the light of false pride but in the light of the most loyal patriotism. In a word any young man that is drafted, who is trained to do useful industrial work and especially one who has had years of experience in needful work such as shipbuilding and its allied industries, should make known his fitness for such work.

It is well-known that countless young men stand ready to drop all when the summons come and fly to the colors, even though remarkable experience and training make them better fitted for the needed work they have at hand.

In these times of trial, to be true to yourself and to the nation, the highest patriotism is essential and a candid statement of preparation and experience in necessary industrial activity should not and will not be understood wrongly. Indeed when freed from a false sense of pride, such readiness to serve in any capacity where best to bring to a happy conclusion the

issues at hand, may be classed as the highest and truest patriotism.

Men impelled by such lofty ideals as these are entitled to the same recognition as those who take the field. But whether this recognition be given or not, to be true to the nation, but one course is open.

Increasing commercial and engineering relations with our Pacific neighbors compel engineers of the West to give consideration to the deplorable conditions of money standards in the Orient.

Oriental Money Standards vs. Engineering Endeavor

Since someone has tersely defined an engineer as a person who could create for one dollar material accomplishment that any person could do for two dollars, the question of true engineering must consequently largely interlink itself with the value of a dollar. And when this dollar fluctuates in value from day to day another variable is at once added to complicate engineering computation.

Let us then touch upon some of the leading characteristics of money standards in the Orient. Many of us have heard of the almost universal usage throughout the Orient of the Mexican dollar. Until recently the Mexican dollar was the established legal coin for the Philippine Islands and the Asiatic Coast points.

It is interesting to run back historically for a few moments to satisfy our curiosity as to why Mexico, today rent and riddled with civil strife, with practically no foreign commerce, could ever have exerted such a tremendous influence on Oriental life as to have its coinage system adopted in preference to all others.

The story is quickly told and after it is related, we see once again how the rise and fall of a nation may happen in a few brief years, leaving as earth marks of its former prowess only a skeleton in the emblement of its money standards.

In the days of the Spanish Armada and the establishment of the Spanish Main, Mexico, teeming with the wealth of the Aztecs, became world famous as the center of civilization in the Western Hemisphere. Her eastern ports became crowded with ships laden with precious metals for the home country and her western ports became the center of activity with Far Eastern or Asiatic trade. The Philippine Islands, the Chinese, and even the Japanese felt the influence of Mexican prowess in the Pacific, and so naturally the Mexican dollar became firmly established as the medium for the interchange of commerce.

Today this last relic of Spanish or Mexican supremacy is fast disappearing from modern use in the Far East.

And well it might, for the confusion resulting from a conflict with the established gold standards of the great nations of the world is hardly in keeping with modern advance in international commerce. Since, nevertheless, this fluctuation or rather conflict of standards is still to be found throughout China and many of the other eastern countries, it is well to be somewhat prepared in order that no undue confusion may result when one is forced to deal with transfers of money from one system to another.

Japan has for some years recognized the necessity of having an established standard of money values which would bring about a fixed ratio of exchange with foreign countries. As a consequence, some years back, she adopted the gold standard with the yen as the principal basis of legal tender. The yen has the value of approximately fifty cents in American money and since one hundred sen make one yen, their smallest coinage notation, the sen is equal to one-half cent in our standard.

Similarly in the Philippine Islands, since the American occupation, money values have been standardized and the Mexican dollar has entirely disappeared from circulation. Interesting tales are told by those who first went to the Philippine Islands immediately after the Americans made their appearance, as to how the shrewd Chinese capitalists who controlled the money markets of these islands, reaped large fortunes when fluctuations occurred with money standards in neighboring countries. No bank notes were in circulation and everyone received their pay in Mexican silver dollars which approximated a value of fifty cents in American money. It was almost necessary to use a wheel-barrow to carry one's savings around. But the surprising thing was the rapidity with which the Chinese bankers could send shiploads of coinage out of the country to the coast of China when any advantage in coinage value was to be gained.

Hence affairs relating to money standards were seen to be so absolutely undependable that a definite readjustment was finally effected which resulted in the Philippine peso, today the legally authorized unit of money denomination.

The peso has an exact ratio of two to one, with the American system of coinage. As a consequence, the peso is equivalent to fifty cents, and the centavo, the one-hundredth part of a peso, has a value of one-half a cent in our money.

Coming now to the Asiatic Coast points, the real confusion begins. In Hong Kong, the great maritime commercial center of the Far East, the Mexican silver dollar there in use has a daily fluctuating value, and if one has money in the bank, it is necessary to read the morning's paper to find how much one is really worth. In normal times the Mexican dollar will vary in value from forty-three cents to fifty cents. During the present international struggle, however, the money markets of the Far East have become so demoralized that recent quotations give the value of Hong Kong and Shanghai money as only worth twenty-one cents to one hundred cents valuation of American money.

In the interior of China, the financial condition or rather the rating of the coinage values is far more demoralizing and subject to even more violent fluctuations from day to day.

In the enlarged activities now before the engineer of the West, the financial intercourse with our foreign neighbors is so closely interwoven with engineering activity itself that the engineer should devote much time and study in giving of his thought and advice to a harmonious solution, looking toward the stabilizing of the Oriental money standard.

PERSONALS

Max Thelen, president of the California Railroad Commission and president of the National Association of Railroad Commissions, as chairman of a committee recently appointed by Governor Stephens in behalf of the State Council for Defense, looking toward the conservation of crude petroleum, has rendered a noteworthy report which has been forwarded to President Wilson for consideration. The report outlines several broad ideals, toward which utility companies using fuel oil as an auxiliary to hydroelectric energy can best co-operate both in their internal balancing of

steam and hydroelectric generation and their external relationships the one with the other. But best of all the character of usefulness that such work as this has in store, points to a new departure in commission helpfulness that holds exceedingly bright prospects for utility aid in research and other matters for the future.

Olaf Laurgaard, a consulting engineer of Portland, Ore., has been appointed city engineer of that city, replacing Philip H. Dater.

H. F. Jackson, president and general manager of the Sierra & San Francisco Power Company has returned from a visit to Los Angeles.

Fred Fowler, electrical engineer for the Forest Service is among the student officers at the engineer officers' training quarters at the Presidio.

D. E. Harris, vice-president of the Pacific States Electric Company, has returned to San Francisco from an extended trip through the Northwest.

Chas. F. Gilcrest, superintendent of the meter department of the San Joaquin Light & Power Corporation at Fresno, is a recent San Francisco visitor.

Rudolph W. Van Norden, a consulting engineer of San Francisco, has removed his offices from the Rialto Building to enlarged office facilities at the Alaska Commercial Building.

H. R. Noack, in charge of the hardware and insulator department of the Pacific States Electric Company, headquarters, San Francisco, is looking after business in the Seattle field.

J. W. Simpson, western manager of the Federal Sign System (Electric) expects to leave San Francisco July 17 for Chicago to be gone during the remainder of July and the early part of August.

THE NEW JOURNAL SERVICE: The series of articles on rate regulation that has started in this issue under the authorship of C. E. Grunsky, the eminent rate specialist of San Francisco, will be continued for many issues during the coming season. In his discussions Mr. Grunsky will treat of a host of vital points now perplexing engineers and regulating bodies in this important phase of engineering activity. The bonus, the water right value and appreciation factors will all be treated in view of recent court decisions and evolution of the science.

In the issue of the Journal for August 1, 1917, the subject of electric trucks will be treated. A mass of convincing experimental data has been gathered by the largest department store in Portland. This store uses electric trucks of its own design as well as gas operated cars, and it will be shown that in the electric truck of the future the central stations may anticipate a pleasing and profitable load throughout the West.

In recent months great power plants of Arizona have been brought into the limelight as models in efficiency and as representing new advances in power plant design. A beautifully illustrated and most instructive article on the new power plant of the Inspiration Copper Mining Company situated in Arizona, will appear August 15, 1917.

A host of other good things are in the planning.

S. T. Harding, assistant professor of irrigation at the University of California, has returned to Berkeley from several weeks of professional work on soil classification in and about Spokane, Wash.

David T. Mason, professor of forestry at the University of California, has been commissioned a captain in the forestry regiment of the Engineer Corps that is being organized to proceed to France at an early date.

George L. Dillman, a consulting engineer of San Francisco, is distributing an "afterword" to his memorable address on the principle of authority and responsibility which proved so helpful to engineers a year ago.

Elmer Zimmerman, **Guy Barker** and **George Hagar** are additional contributions of the Pacific Gas & Electric Company's engineering staff in commissioned officers for the United States in its war against Germany.

Raymond Matthew, for the past six months assistant engineer in the offices of Charles H. Lee, consulting engineer, Los Angeles, Cal., has accepted the position of assistant engineer with the Idaho Irrigation Company, Richfield, Idaho.

J. D. Galloway, a consulting engineer of San Francisco, is one of the twenty-four engineers of the United States that is to sit in the Council of the United Engineering Society formed by the four great national engineering societies.

Burton R. Stare, president of the Northwestern Supply Company, dealers in electrical supplies at Seattle, recently returned from a week's outing with his family and a number of friends taken in the vicinity of Whitehorse mountain.

W. B. Greeley, formerly assistant forester at Washington and well known as the organizer of Forest District Number One in the Northwest has been commissioned as major in the forestry regiment of the Engineer Corps that is to proceed to France at an early date.

Harry S. Whiting, president of the Pierson-Roeding Company of San Francisco, and Miss Lucy E. Cormack were married recently at the home of the bride, 1235 Seventh avenue, by Rev. Austin B. Chinn. Miss Cormack is the daughter of C. F. Cormack, manager of the Hasslett Warehouse Company.

Thomas Morrin and **Albert A. Coddington**, consulting mechanical engineers of San Francisco have entered into a partnership under the firm name of Morrin & Coddington. The firm is specially equipped to handle steam power plant design, mechanical equipment of buildings, water works, valuations and reports.

Major Ralph D. Mershon, Engineer Officers' Reserve Corps, has been relieved from his present duties and will report by letter to the chairman, Naval Consulting Board, at Washington, for duty in connection with military research, retaining station in New York, N. Y. Mr. Mershon is a past president of the American Institute of Electrical Engineers.

Charles N. Black, formerly vice-president and general manager of the United Railroads of San Francisco, and a member of the firm of Ford, Bacon & Davis of New York City, has been made manager of exports for J. P. Morgan & Company, in which capacity he has charge of all purchases for the allies in the United States.

Captain Richard Park, well-known in San Francisco and vicinity as the active agent in the United States Engineer Corps in organizing the engineer regiments in and about central California has been promoted to the rank of major. This comes as a source of great satisfaction to all in as much as he has been long recognized as a most enthusiastic and able officer in the governmental service.

F. C. Searle, general representative of the sales board of the Allis-Chalmers Manufacturing Company of Milwaukee, is visiting the Pacific coast and making a careful study of the development in the shipbuilding industry. The work at Seattle has come under his observation and in company with **R. T. Stafford**, northwest manager of the Allis-Chalmers Company, he has visited Portland. He will go to San Francisco and Los Angeles before returning home.

C. E. Clark, electrical and illuminating engineer, for Woodill & Hulse Electric Company, Los Angeles, Cal.; **R. J. Downie**, electrician, Union Iron Works, San Francisco; **L. H. Grant**, armature winder and power station operator, Fresno Traction Company, Fresno, Cal.; **S. J. Kennedy**, foreman of construction and maintenance, Great Western Power Company, Oakland, Cal.; **M. Manwaring**, superintendent power plant department, Murray City Corp., Murray, Utah; **H. H. Millar**, inspector in charge, Oakland Bureau, Electrical Testing Laboratories, Oakland, Cal.; **E. M. Ober**, traffic engineer, B. C. Telephone Co., Ltd., Vancouver, B. C.; and **H. J. Smith**, chief draftsman, Sierra & San Francisco Power Company, San Francisco, have been elected associates of the American Institute of Electrical Engineers.

OBITUARY

W. G. Bee, vice-president and past general salesmanager of the Edison Storage Battery Company, died July 11, 1917, at Orange, N. J., after an illness of over a year. Mr. Bee had long been an active figure in the electrical industry and was Mr. Edison's personal friend and assistant in his last visit to the West.

Arthur Gunn, formerly president and general manager of the Wenatchee Valley Gas & Electric Company, whose untimely death was announced in the columns of the Journal



The Late Arthur Gunn

of Electricity June 15, 1917, continues to be the subject of comment among the hydroelectric fraternity throughout the West. At a recent meeting of the executive committee of the Northwest Electric Light & Power Association of which organization Mr. Gunn was the first president, a committee of

five was appointed to draft suitable resolutions. On the committee are Norwood W. Buckett and C. J. Edwards of Portland, Oregon; W. T. Wallace of Boise, Idaho; J. F. Roche of Butte, Montana; and J. F. Forquhar of Spokane, Washington.

TRADE NOTES

The Pacific States Electric Company has moved its Seattle offices from 307 First avenue South to 570 First avenue South, where, larger and more convenient quarters have been secured.

The Oregon Lumber Company at Baker, Oregon, has placed a contract with the Allis-Chalmers Company for an electrically driven sawmill to cut Oregon pine. This mill is to have a 625 k.v.a. Allis-Chalmers steam turbine unit.

The turbine business on the Pacific coast is exceptionally good with the Allis-Chalmers Company. The Snoqualmie Falls Lumber Company at Snoqualmie Falls, Washington, is installing a 5000 k.v.a. Allis-Chalmers steam turbine unit together with high vacuum Allis-Chalmers jet condenser. It is expected that this plant will be in operation within a short time as all the equipment has been received at the mill.

The Allis-Chalmers Manufacturing Company, having offices at 115 Jackson street, Seattle, recently closed a contract with the city of Seattle for two 4700 k.w. transformers, one 15,000 volts primary and the other 2500 volts secondary at \$13,440. They will be direct-connected, two phase and used in connection with the 10,000 k.v.a. steam turbine unit recently purchased from the Allis-Chalmers Company for the steam auxiliary station.

NEW BULLETINS

Occurrence and mitigation of injurious dusts in steel works is discussed in technical paper 153 just issued by the U. S. Bureau of Mines.

The results of physical tests of roadbuilding rock in 1916, including all compression tests are to be found in bulletin 537 issued from the office of Public Roads and Rural Engineering at Washington, D. C.

Magnetic and other properties of iron-aluminum alloys melted in vacuo are discussed by T. D. Gensen and W. A. Gatward in bulletin 95 of the engineering experiment station of the University of Illinois.

Westinghouse electrical equipment for ventilating service is described in an attractive eighteen page circular 7193.

Hotpoint Tableware, an attractive booklet of thirty-two pages, has just made its appearance to the trade.

BOOK REVIEW

Electrical Measurements in Practice. By F. M. Fariner. Size 6 by 9 in.; 359 pp.; 230 illustrations; cloth binding. Published by McGraw-Hill Book Company and for sale at the Technical Book Shop in San Francisco. Price \$4.00.

The subject of electrical measurements has received much attention in the literature of electrical engineering. In general, however, the treatment has been from a theoretical or academic point of view. In this volume the author has endeavored to present the subject in a simple, practical manner and from the standpoint of engineers who are actively engaged in making measurements, tests and investigations in the electrical industry.

The author of this work is chief engineer of the Electrical Testing Laboratories and is well qualified to speak authoritatively on the subject matter he discusses.

A chapter that should prove unusually helpful to engineers in the West at the present time is that devoted to maximum demand measurements. The book is well written, the type and illustrations clear and it is believed that it will prove very useful to all those engaged in the subject of electrical measurements throughout the West.

MEETING NOTICES FOR ELECTRICAL MEN

(The California Association of Electrical Contractors & Dealers in convention assembled at Santa Cruz is at this time holding one of the most helpful and enthusiastic gatherings in the history of the electrical fraternity on the Pacific Coast. The latter part of the month the Pacific Coast Electrical Supply Jobbers are to hold their convention at Del Monte, while in the middle of September Spokane is to be the Mecca toward which eyes of the electrical industry of the West will turn as the Northwest Electric Light & Power Association is to hold its convention at that time. Other news items concerning meetings of interest to electrical men throughout the West are to be found in the following lines.—The Editor.)

The California Association of Electrical Contractors & Dealers

At the time these forms are going to press the assemblage at Santa Cruz of the convention of this organization is beginning to gather. From every quarter enthusiasm is displayed and a remarkable gathering is in swing, full details of which will be published in our next issue.

The Northwest Electric Light & Power Association

At a meeting of the executive committee of this association, called by Mr. O. B. Coldwell, chairman, and held in the offices of the Portland Railway, Light & Power Company, at Portland, on June 29, 1917, the following business was transacted:

Those present were Mr. O. B. Coldwell, chairman; Mr. L. B. Faulkner, Mr. E. G. Robinson, Mr. P. A. Bertrand and Mr. M. C. Osborn.

A. H. Halloran, managing editor of the Journal of Electricity, and secretary of the Pacific Coast Section of the N. E. L. A., of San Francisco; R. M. Townsend, representing the public policy committee of Oregon, and J. C. Martin, chairman of the hydroelectric and technical committee, both of the association, were also present.

Chairman Coldwell announced that the first order of business would be to elect a member to succeed Mr. Arthur Gunn, recently deceased and a member of the committee. Motion was made by Mr. Osborn and seconded by Mr. Faulkner, that Mr. George D. Brown who has been elected to succeed Mr. Gunn as president and general manager of the Wenatchee Valley Gas & Electric Company, at Wenatchee, be elected. Motion carried.

Other important business relative to the dues of company members and relative to the employment of an association man to assist the organization in technical matters were discussed.

Sentiment was strongly evident in favor of a closer relationship with the Pacific Coast Section of N. E. L. A.

Much enthusiasm prevails looking toward a successful outcome of the Spokane convention in September.

The San Francisco Electrical Development & Jovian League

There will be no meetings of the San Francisco Electrical Development & Jovian League during the months of July and August. On September first the League officials are planning to give the activities of the association a gigantic boost for the coming season by holding a smoker, the proceeds of which are to go to the Red Cross.

At the June 27th meeting of the League, a resolution was adopted placing all members who may be called to the service

of the United States on the Honor Roll during their term of absence, and the appointment of a committee to maintain correspondence with such honorary members in the field.

In line with the foregoing, W. S. Berry, western sales manager of the Western Electric Company, W. S. Coleman of the Pacific Gas & Electric Company, and Robert Sibley, editor of the Journal of Electricity, have been appointed by President Alvord of the League.

Among those already on the roll are: Capt. Malone of Northern California Power Co., Captain Baker of Sierra & San Francisco Power Co., and Captain Baldwin and Lieutenant Schloss, both of the General Electric Company.

Portland Section A. I. E. E.

The following officers have been elected by the local sections of the A. I. E. E., Portland, Oregon, for the ensuing year: J. C. Martin, chairman; E. D. Searing, secretary-treasurer; W. D. Scott, R. M. Boykin, board of directors.

The Oregon Society of Engineers

The meeting of the Oregon Society of Engineers for June 25, 1917, was devoted to "City Zoning." The following interesting program was given:

A. G. Clark, presented the plans and objects of the Home Industry League of which he is manager; H. E. Plummer told why the proposed Building Code of the City of Portland contains provisions for limiting the heights of buildings; E. B. McNaughton spoke of "City Zoning and Industrial Development"; Ellis F. Lawrence

had for a subject "City Zoning and Planning with special emphasis on the Architectural and Aesthetic Features"; J. J. Sayer gave the views of the Portland Building Owners and Managers Association on "Zoning as Applied to Portland Conditions," and C. Lewis Mead discussed city planning from the viewpoint of the Portland Realty Board.

Exposition of Chemical Industries

An exposition of chemical industries is to be held at the Grand Central Palace in New York City the week of September 24, 1917. Electrical men interested in electro-chemical development are urged to attend.

The Council of the United Engineering Society

On June 27th was held the first meeting of the Engineering Council. This body is a department of the United Engineering Society and has recently come into being as a medium of co-operation between the four national engineering societies. The function of the Council may perhaps best be described by the following extract from the by-laws of the United Engineering Society: "The Council may speak authoritatively

BUILDERS OF THE WEST—IX



HERBERT HOOVER

It is an ever increasing source of gratification to all that the engineers of the West have not only built physical creations in this section of the country that have surpassed in brilliancy and in design the achievements of older and more experienced communities, but that her engineers have gone forth to all the world and accomplished similar feats of engineering. Much might be said of Herbert Hoover, the noted engineer. But to Herbert Hoover, the private citizen, this issue of the Journal is dedicated in appreciation of the countless beautiful expressions concerning him that continue to flow westward from suffering and broken-hearted Europe, which make us all proud to feel that we, too, live and work in the same section of our land that gave strength and power to this mighty builder.

for all member societies on all public questions of a common interest or concern to engineers."

The council is composed of twenty-four members, five being appointed by each of the four founder societies and four by the United Engineering Society.

National Electrical Contractors' Association

The quarterly meeting of the executive committee of the National Electrical Contractors' Association was held in Chicago, June 19th and 20th, at the La Salle Hotel. There was a full attendance at this meeting.

There attended, by invitation, Mr. Wm. L. Goodwin, formerly of California, but now from New York, who is giving much time to the proper organization of industry; Mr. J. M. Wakeman, general manager of the Society for Electrical Development; Mr. E. McCleary, one of the foremost and influential contractors in Detroit, and Mr. Louis Kalischer, local contractor of New York; Mr. Ernest Freeman of the Freeman-Sweet Company, of Chicago, former president of the N. E. C. A., and Mr. Hilton, treasurer of the organization who is from Syracuse.

A resolution was passed with regards to the annual convention to be held in New Orleans, La., October 10th to 13th, inclusive, to the effect that the national stress of affairs justified the officers of the association in making every effort to make this the best and most widely attended convention thus far held.

Illuminating Engineering Society

The election of the following officers of the Council for the fiscal year 1917-1918, was confirmed by the Council on June 14, 1917. These men were elected to fill the offices made vacant by expiration of terms: President, G. H. Stickney; vice-presidents, W. G. Hoyt, C. E. Stephens; general secretary, Clarence L. Law; treasurer, L. B. Marks; directors, R. F. Pierce, S. C. Rogers, P. S. Young.

Code of Ethics of the Oregon Association of Electrical Contractors and Dealers

Section 1. Members of the Association shall regard themselves as being engaged in a business in which there is a well-defined duty and obligation toward the public and themselves. The business demands that members use every honorable means to uphold the dignity and honor of this vocation, to exalt its standards and to extend its spirit of usefulness.

Section 2. Every member of this Association should be mindful of the public welfare and should participate in those movements for public betterment in which his special training and experience qualify him to act. He should not, even under his client's instruction, engage in or encourage any practices contrary to the Rules and Regulations Safeguarding Life and Property, for as he is not obliged to accept a given piece of work, he cannot, by urging that he has followed his client's instruction escape the condemnation attaching to his act. Every member of this association should support all public officials and others who have charge of enforcing safe regulations in the rightful performance of their duty. He should carefully comply with all the laws and regulations touching his vocation, and if any such appear to him unwise or unfair, he should endeavor to have them altered.

Section 3. It is unbusinesslike for a member of this association to assist unqualified persons to evade or to lend himself in the evasion of any of the recognized rules and regulations governing electrical work.

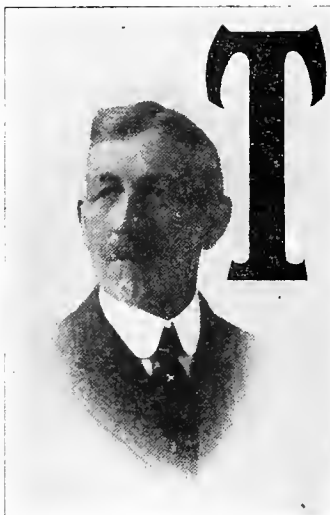
Section 4. Members of this association should expose, without fear or favor, corrupt or dishonest conduct and practices of the members of their business, and it is their duty to bring to the attention of the proper authorities the existence of electrical conditions which are unsafe to life and property.

Section 5. Members of this association owe a duty to the business of refusing to furnish estimates to general contractors who do not regard bids as final and binding upon which they are awarded general contracts.

Section 6. Members of this association shall not falsely or maliciously injure, directly or indirectly, the business reputation, prospects or business of a fellow member of this association.

Section 7. Members of this association shall not attempt to supplant a fellow member after definite steps have been taken toward his employment or toward the letting of a contract to him. Nor should they offer any interference in the carrying out of said contract or commission to the end that loss or damage may result to the fellow member.

Pacific Coast Electrical Supply Jobbers



SAMUEL H. TAYLOR
The staid, conservative figure of Colonel Taylor will be a prominent feature of the convention at Del Monte. The Colonel possesses a rare combination of executive talent and ability to make a visitor feel at ease. Don't fail to give him a chance to welcome you.

THE convention of the Electrical Supply Jobbers' Association at Del Monte July 26, 27 and 28 bids well to be the success of the season. Following closely upon the heels of the contractors' convention at Santa Cruz, which proved such a marked success in every particular this statement needs proof. But there is such a real genuine sincere feeling that pervades the invitations that have gone forth summoning in all those who would be interested in the forthcoming meeting that this in itself bespeaks a goodly assemblage.

In detail this invitation is as follows:

"You are hereby invited to attend the convention of the Electrical Supply Jobbers' Association at the time and place above specified. These conventions have become so stand-

ardized that it is perhaps unnecessary to do more than to let you know when and where the meeting will be held.

"There will be the usual golf tournaments, the golf dinner Saturday night, July 28th, with special features, the open session Saturday morning and the other features of the convention.

"We are inviting you not as a matter of form, but because we would like to see you with us.

"Come and improve your temper, your golf, your head, your heart and your electrical conscience."



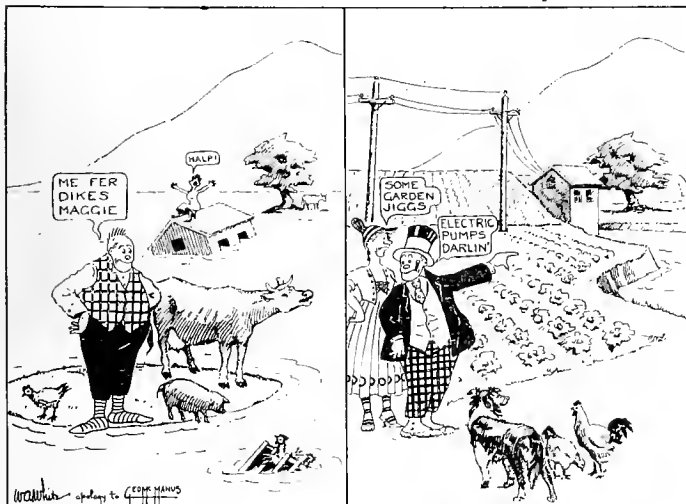
CHARLES WIGGIN

Charlie has come out into the open a little since this picture was taken, but if you really want to see what a persistent study of "alternating—cross-currents or how-I-grow-whiskers" can do for a man don't fail to attend the convention and give Bill Berry the once over.

OF INTEREST TO UTILITY COMPANIES

BRINGING UP FATHER

By Hard Knocks



PROBABILITY

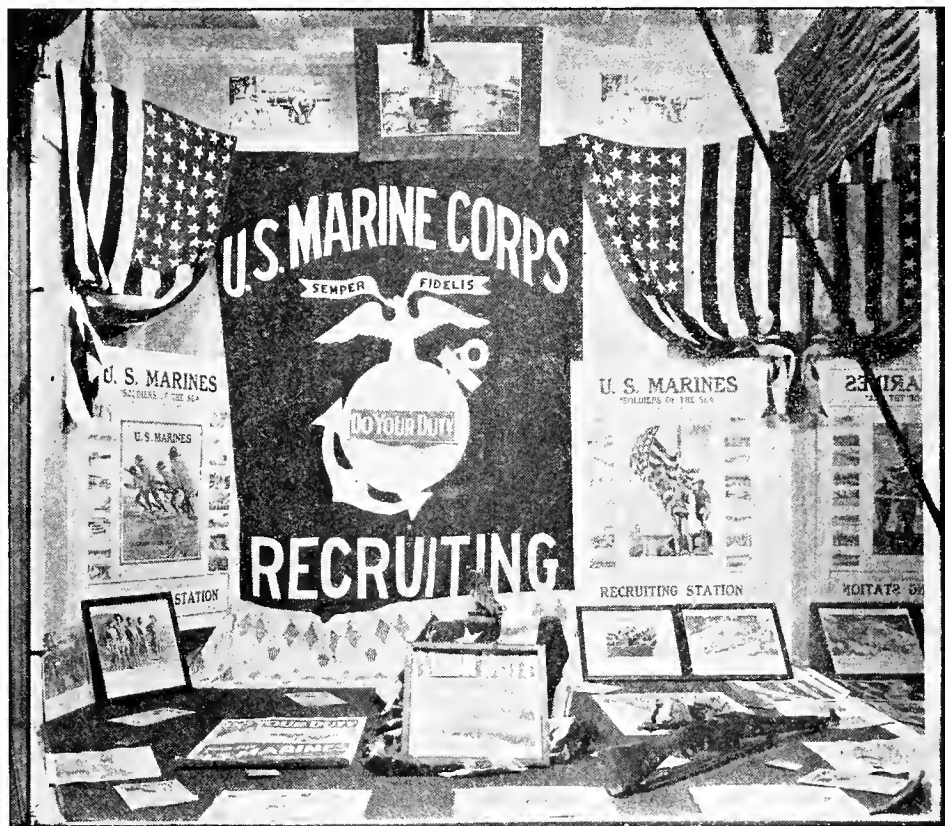
POSSIBILITY

JIGGS AND MAGGIE ASSIST IN ELECTRICAL AGGRANDIZEMENT

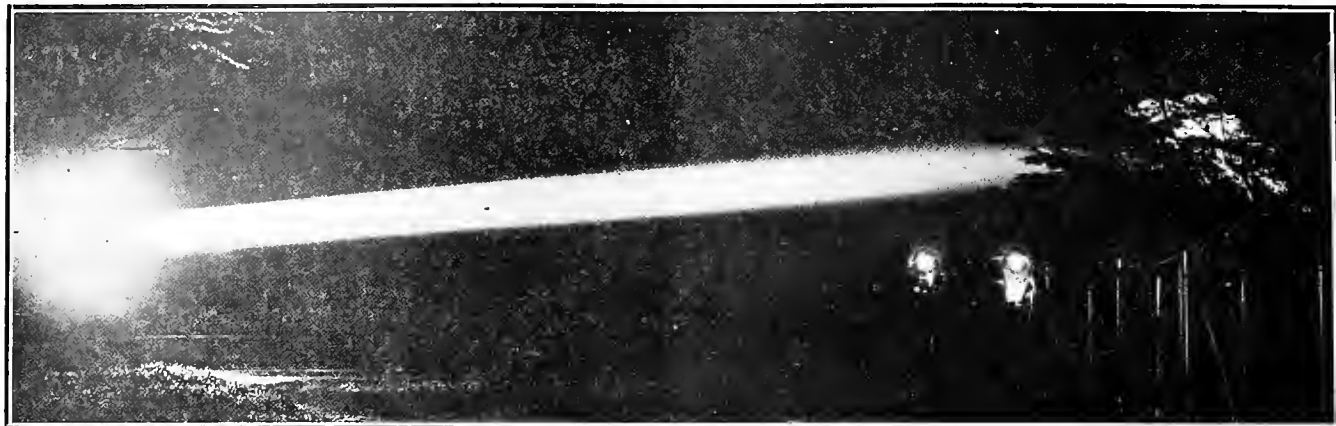
Here is a forceful instance of how the popular newspaper comic, known as "Bringing Up Father," is used in the reclamation areas of western Washington by the North Coast Power Company to promote the use of electrical energy in this profitable field of electrical application. An important psychological principle is here made use of that other utilities of the West may well bear in mind in putting out similar publicity matter. The combination of a widely known comic idea with the home building incentive has such an agreeable tinge to it that the reader's attention is focused at once and the point of electrical aggrandizement driven home so unconsciously that the reader is taken unawares and the idea fixed firmly in mind.

THE UTILITY AND NATIONAL SERVICE

Never before in the history of the electrical industry has the public generally been forced to admit the wonderful possibilities of service by the hydroelectric companies of the West apart from the vending of electricity than has come to the public conscience in the past thirty days. The great Liberty Loan, the Red Cross, and a thousand other aids have been rendered of incalculable benefit to the nation. Here is how the Pacific Power & Light Company has contributed most effectively in boosting the recruiting campaign in the Northwest for the U. S. Marine Corps.



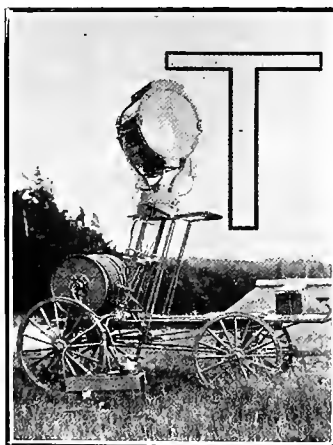
LATEST IN EVERYTHING ELECTRICAL



The Electric Arc and Its Use in the Modern Field Service

(Electricity is playing the leading role in the present world conflict. Engineers of the West are fast filling needed positions to revitalize the armies and navies of the allied forces both at home and abroad. Below will be found notations on additional calls that are being made for electrical men and officers for the engineer regiments that are being formed. Notes on other interesting and important advances in the electrical industry follow.—The Editor.)

ELECTRICITY IN THE ARMY



A Portable Electric Arc in the U. S. Army Service

THE applications of electricity in modern warfare are practically without limit. All men of the electrical industry are called upon to give particular attention to the following classes of men needed in the mobilization of the nation's engineering strength.

Men skilled in civil engineering and similar occupations are wanted in the Engineer Enlisted Reserve Corps of the United States Army for war service. Skilled laborers, mechanics and artisans, miners, surveyors, draftsmen, lithographers, boatmen, electricians, and others engaged in engineering or mechanical

lines in civil life are wanted for enlistment in the Engineer Enlisted Reserve Corps of U. S. Army. The War Department desires to secure immediately a large enrollment of enlisted men in this Corps, and suitable men are urged to make application either by mail or in person to one of the following offices:

District Engineer Officer, 204 Pine Street, San Francisco, Cal.
 District Engineer Officer, 723 Central Bldg., Los Angeles, Cal.
 District Engineer Officer, 602 Burke Building, Seattle, Wash.
 District Engineer Officer, First District, 806 Couch Building, Portland, Ore.
 District Engineer Officer, Second District, 321 Custom House, Portland, Ore.
 District Engineer Office, Third District, 405 Customs House, San Francisco, Cal.
 District Engineer Field Office, Eureka, Cal.
 District Engineer Field Office, Fort Rosecrans, Cal.

All members of the National Engineer Societies and all other civilian engineers or other civilians engaged in engineer construction or contract work, electrical engineering, mining and allied professions, are appealed to to induce high class skilled men to join the enlisted reserve corps of engineers.

The following classes of men are wanted:

- | | |
|--|---|
| a. Topographical surveyors and sketchers, including good instrument men. | n. Firemen. |
| b. Draftsmen, topographical and mechanical. | o. Machinists. |
| c. Photographers and blueprint men. | p. Masons. |
| d. Lithographers and zincographers. | q. Caulkers. |
| e. Quarrymen (skilled in explosives). | r. Riggers. |
| f. Miners. | s. Expert axemen. |
| g. Skilled carpenters. | t. Boatmen. |
| h. Bridge carpenters. | u. Horseshoers. |
| i. Blacksmiths. | v. Farriers. |
| j. Plumbers and pipefitters. | w. Packers. |
| k. Electricians. | x. Teamsters. |
| l. Enginemen, steam. | y. Saddlers. |
| m. Enginemen, gas. | z. Cooks. |
| | aa. Assistant cooks. |
| | bb. Clerks. |
| | cc. Musicians. |
| | dd. Signalmen, as required by Army Regulations. |

An Engineer Company is composed of 109 engineer soldiers, graded as follows:

3 Sergeants, 1st Class.	1 Horseshoer.
1 Supply Sergeant	2 Buglers.
12 Corporals.	1 Mess Sergeant.
2 Cooks.	6 Sergeants.
59 Privates.	1 Saddler.
1 First Sergeant.	19 Privates, 1st Class.
1 Stable Sergeant.	
	109 Total.

Sergeants must be at least 30 years old and have sufficient education to perform the duties of the grade and must hold in civil life, a position equal to, or of the same importance as foreman in the Engineer Department of the Army, and shall be expert in one or more of the special qualifications listed in sub-paragraph 1 above.

Corporals must be at least 25 years of age and must hold in civil life, a position equal to, or of the same importance as foremen in the Engineer Department of the Army, and shall be expert in one or more of the special qualifications listed in sub-paragraph 1 above.

Privates, 1st class, and privates, must have one or more of qualifications listed above.

The rates of pay are as follows:

Master Engineer, senior grade	\$75	Mess Sergeant	\$36
Master Engineer, junior grade	65	Supply Sergeant	36
Regimental Sergeant, Major	45	Stable Sergeant	36
Battalion Sergeant Major	45	Sergeant, 1st Class	45
Regimental Supply Sergeant	45	Sergeant	36
Battalion Supply Sergeant	45	Corporal	24
		Cook	30
		Bugler	15
		Horseshoer	30
		Saddler	21

Color Sergeant	36	Wagoner	21
Sergeant Bugler	40	Private, 1st Class.....	18
First Sergeant	45	Private	15

Further information of the details of enlistment will be sent upon request made to any district engineer officer or to any of the reserve corps officers listed above.

All enlistments are desired for war service and none will be accepted for less than the period of the war. "All subsistence, equipment, uniforms and transportation are furnished by the government."

The Engineer Corps in our army corresponds to the famous Royal Engineers of the British army, who have constructed the marvelous system of field fortifications that have for nearly 3 years sheltered the English armies in France and enable them to withstand the onslaught of the Germans.

Second, Officers' Training Camp, The Presidio, San Francisco

To provide officers for the drafted forces of the National Army the War Department has adopted the policy of commissioning all new officers of the line (Infantry, Cavalry, Field and Coast Artillery) purely on the basis of demonstrated ability after three months' observation and training in the Officers' Training Camps.

A second series of officers' training camps will be held beginning August 27, 1917, with the definite mission of producing a body of line officers (Infantry, Cavalry, Field and Coast Artillery) capable of filling all places in the grades above lieutenant and many of the places in the grade of lieutenant in the second 500,000 troops.

The second Camp for the Western Department will be held at the Presidio Reservation, San Francisco, Cal., and will open on August 27, 1917, and close November 26, 1917.

Every candidate must file his application in person with the local committee of the Military Training Camps Association in the town in which he resides. A Military Training Camps Association Committee will be appointed in every town having a population of not less than 2500 within the eight states from which candidates are to be drawn for the Presidio Camp. From these committees application blanks can be secured. Information as to the identity and address of the above mentioned local committees can be had from the cashier of any bank. Do not mail your application.

The headquarters of the Military Training Camps Association for the Western Department can be addressed as below.

P. M. LANSDALE, Executive Secretary,

Military Training Camps Association of the United States,
Western Department, 201 Pine St., San Francisco, Cal.

"MORE THAN 3000 USES FOR ELECTRICITY"

That electricity is invading every line of human endeavor is well known, but that there are more than 3000 applications of electric current in 109 trades and industries has hardly been appreciated. The Society for Electrical Development, after an exhaustive research, has just issued a booklet listing these applications. It has been sent free to all members of the society.

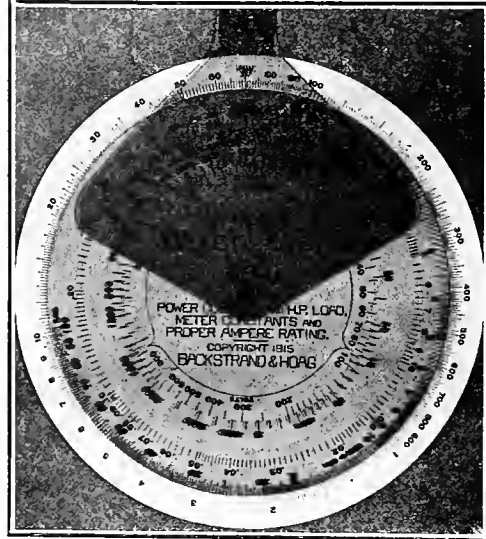
A LIVE CAMPAIGN FOR THE METHOD ELECTRICAL

Fred C. Todt in a remarkably forceful contribution to the news bulletin of the Pacific States Electric Company has thus summarized the effective work of the Hurley organization in abolishing the drudgery of the household by means of the method electrical:

"In summing up the situation on the Portland Front we report with much confidence that the drive against washday drudgery will net many new positions to our arms and ultimately result in reducing the number of positions held by washday drudgery to a number so small that their existence will be difficult to locate and will cause us but little concern"

A NOVEL CALCULATING DEVICE

A Novel Calculating Device has recently been perfected by C. M. Hoag and C. F. Backstrand of Riverside, California. The device is constructed on the principle of the circular slide rule with scales arranged for determining metered loads directly, without the use of a meter formula. Salesmen for machinery and power concerns have found that this calculator has filled a long felt need of a device that may be used

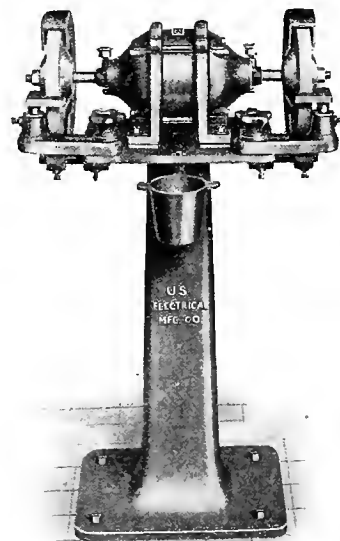


A New Rapid Calculator

by a person not familiar with meter formulas. The following results may be read directly with a setting on the calculator: Horsepower and kilowatt load, power cost in dollars per hour and necessary ampere rating for meters at any voltage or load. It is adapted for use with Westinghouse, General Electric or Ft. Wayne meters, and the device may also be used as a slide rule for other calculations. The price of this calculator together with a substantial leather case is \$1.50. On sale at the Technical Book Shop, 613 Mission street, San Francisco.

NEW ELECTRICALLY DRIVEN EMERY WHEELS

The new compact design of electrically driven apparatus is set forth in the illustration shown herewith in which

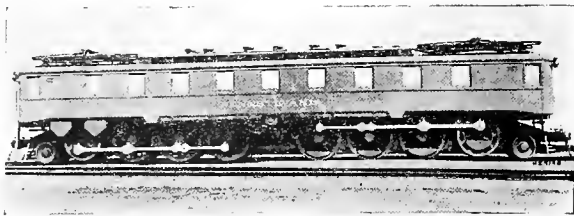


A Recent Advance in Shop Equipment

the motor forms the central portion of the drive. These designs are by the U. S. Electrical Manufacturing Company of Los Angeles.

THE MOST POWERFUL LOCOMOTIVE IN THE WORLD

One more forward step has been taken by an important American railroad in an endeavor to improve traffic conditions by increasing the efficiency of its present track equipment. Such a step is the recent construction of the most powerful electric locomotive ever built, a joint design of the Pennsylvania Railroad Company and the Westinghouse Electric &



The Largest Electric Locomotive in the World

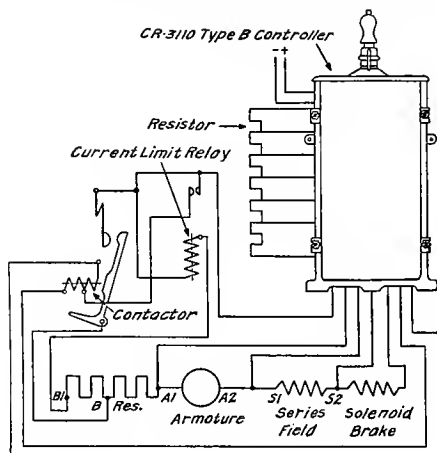
Manufacturing Company. The mechanical parts were erected at the Juniata shops of the railroad company at Altoona, Pa., and the electrical equipment built at the East Pittsburgh shops of the Westinghouse Company.

This locomotive, capable of exerting 7000 horsepower, or more than any locomotive ever built, is the first of what will be a standard type of high powered electric freight engines of the Pennsylvania railroad, and by them is designated as Class FFI. It is interesting to note that the design of this monster is simply another advance in railroad practice by this railroad, thus following a program exemplified by the building of the first steel passenger car.

NEW SEMI-MAGNETIC DYNAMIC BRAKING CONTROL FOR CRANE HOIST SERVICE.

The General Electric Company has recently brought out an automatic device which can be added to their standard Type B drum controller and thus make a very serviceable semi-magnetic dynamic braking control for crane hoist service.

A dynamic braking, manually operated, drum type controller is more severe, on the commutator of a direct current series motor than is a plain reversing manual controller, because, when lowering, the motor is connected similar to a



Connections for Crane Hoist Service

shunt wound motor and does not have the inherent protection of the series field. In many installations, where the service is severe, a semi-magnetic equipment will materially assist commutation. This equipment is useful also where the service is not quite severe enough to justify the expense of a full magnetic equipment.

This device protects the commutator from severe arcing. It protects the controller fingers and segments from severe

burning. It enables the motor to run at a higher lowering speed for a given severity and condition of service, provided extra resistors are used to weaken the motor field.

SPARTAN PLUG ADAPTER FOR SCREW BASE RECEPTACLE

The majority of current consuming devices sold and used today have extension cords with separable attachment plugs of the standardized type. To make it possible to use these devices where base board receptacles are of the Edison or screw type, The Bryant Electric Company, of Bridgeport,



An Improved Plug Adapter

Conn, has designed the Spartan Screw Base Adapter shown herewith.

This device is made to be fastened into the standard Edison receptacle by means of the threaded part and will serve to permanently convert the old type receptacle into a "Spartan" device.

A NEW RECORDING-DEMAND WATTHOUR METER

The entire meter is mounted on a cast iron base. The cover is of pressed zinc with dead black finish and is fitted with a dust-proof gasket. The glass windows over the dial and chart are well sealed. The electrical measuring element consists of the standard Westinghouse type OA watthour meter on its own supporting casting but without cover.



The Type R-A Recording Demand Meter

Therefore, this element can be removed from the case as a unit without changing the calibration.

The paper driving mechanism is a metal drum with pins that engage in perforations in the record paper, driven through gearing by the operating spring. The paper, which is furnished in 18 foot rolls (thirty-six days supply), is held on a spindle and is wound off this onto a drum by the driving mechanism.

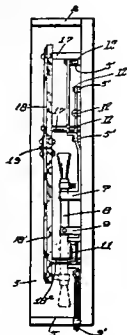
The Type RA Recording-Demand watthour meter is made by the Westinghouse Electric and Manufacturing Company.

WHAT WESTERN INVENTORS ARE DOING

(Automatic train-stops have long been under the careful surveillance of inventors. Below is a brief describing a recent invention along this line perfected by a California investigator in which a pneumatic motor is made use of and an ingenious connection with a storage reservoir effected. Other inventions consisting of a safety means for switch boxes, an aeroplane, and a rotary engine are also briefed. The notation on an insect-killer may also be found useful in construction camps throughout the West where insects often prove a nuisance.—The Editor.)

1,228,839. Safety Means for Switch-Boxes. Lester Siebenhauer, San Francisco, Cal., assignor to Drendell Electrical & Manufacturing Company, San Francisco, Cal., a corporation of California.

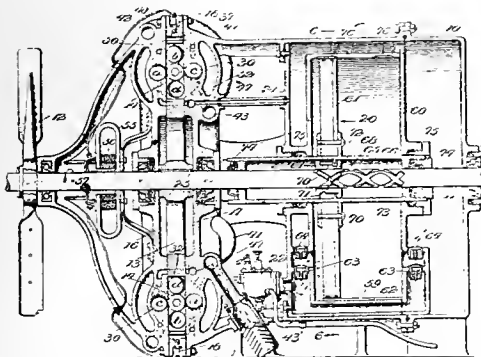
A switch-box the combination of a base, side walls surrounding the same and projecting above the face thereof, exposed bus bars carried on the face of the base, laterals extending from the bus bars, an insulated switch for controlling



each set of laterals, a knife switch associated with the bus bars and controlling the supply of current thereto, and a protecting plate of insulating material supported above bus bars and knife switch for protecting the same against accidental contact therewith, the portion over the knife switch being hinged to that portion over the bus bars and capable of raising to permit the operation of the switch, said hinged portion adapted for overlying the switch when the same is either in open or closed position.

1,229,519. Rotary Engine. Alvah Jewel Howd, Nampa, Idaho, assignor of seventy one-hundredths to Edward H. Dewey, and five one-hundredths to Laura E. McDermott, Nampa, Idaho.

A rotary engine, in combination, a casing having a plurality of separated cylinders formed in opposite walls thereof,

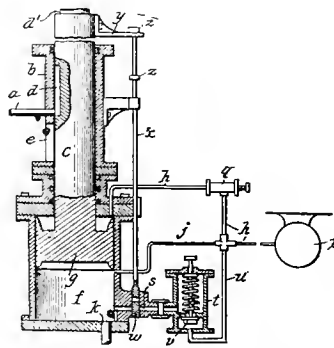


a rotor turning therebetween, and revoluble pistons carried by the rotor successively engaging the cylinders, the pistons being mounted on fixed axes lying in the plane of the rotor.

1,229,151. Automatic Train-Stop. Hiram Gee Sedgwick, Mill Valley, Cal., assignor to The National Safety Appliance Company, a corporation of California.

An automatic train stop, a brake controlling means on the locomotive, a pneumatic motor for operating the, same and

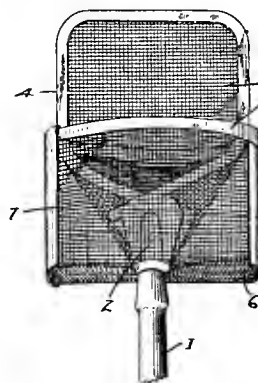
means for connecting the motor to a storage reservoir, means for governing the supply to the motor to cause the same to operate and apply the brakes, means for restoring the motor



to operative position, these means embodying a cut off automatically opened and closed by the action of the motor.

1,228,701. Insect-Killer. Alexander E. Rochfort, Oakland, Cal.

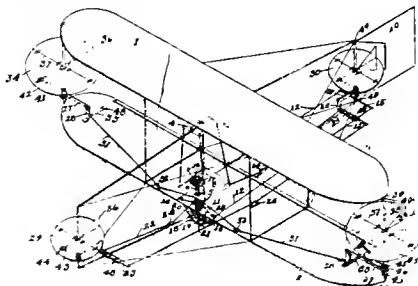
The combination with a handle, a flexible insect killer fixed in the handle and alined with the handle; and a retaining



means attached to the handle and spaced therefrom and surrounding part of the killer.

1,228,705. Aeroplane. Osam Shudow, San Francisco, Cal.

An aeroplane balancing control, the combination of a frame, an operator's swing seat attached to the frame, and a manually controlled lever mounted on the frame so as to



move relative to the frame, and movably jointed to the seat, whereby the lever moves relative to the seat and frame as the former swings relative to the latter.

NEW ELECTRICAL DEVELOPMENTS

(An interesting and significant item in new electrical development during the past semi-monthly period is the judgment of \$51.50 that has been awarded for the \$50,000 damage suit against the Pacific Gas & Electric Co. at Oroville. The case demonstrates the fact that the general public will no longer tolerate an unreasonable valuation on property that is necessary in the development of its publicly regulated utility organizations. Other items of interest in electrical development throughout the West follow.—The Editor.)

FINANCIAL

BOVILL, IDAHO.—At a special election last week the \$5500 bond issue to install an electric light plant, carried.

PHOENIX, ARIZ.—The Phoenix Gas & Electric Company has been given authority by the corporation commission to issue \$555,000 in bonds, of which \$185,000 are to be debenture bonds. The bonds are for extensions and general improvements.

SAFFORD, ARIZ.—An election will be held at Thatcher on the 30th of July for the purpose of determining whether the bonds of said town to the amount of \$18,000 shall be issued for the purpose of establishing and operating an electric lighting plant.

PORT ANGELES, WASH.—An ordinance providing for a special election to authorize the issue of \$30,000 worth of bonds secured by the revenue of the electric light department, has been introduced and put through preliminary stages. The money is to be used to retire outstanding warrants and to provide for extensions and betterments of the lighting system of the city.

SANTA FE, N. M.—The Rio Grande Light, Heat & Power Company has filed in the office of the Bernalillo County Clerk at Albuquerque, a deed of trust for \$3,000,000 pledging its franchise and properties, including the dam, power plant and transmission lines which are to be constructed, to the Fairmount Savings Trust Company of Philadelphia. This action is for bonding the White Rock Canyon project.

OROVILLE, CAL.—A judgment for \$51.50 when the defendant had asked \$50,000 damages was the verdict returned in the condemnation suit of the Pacific Gas & Electric Company against Henry W. Taylor of the Butte Creek district. The power company sought to gain possession of a small piece of Taylor's land on Butte Creek as a dam site. The company already has a wooden dam on Taylor's property and wanted to construct a concrete dam near the old one.

SAN FRANCISCO, CAL.—Creditors of the Gas & Electric Appliance Company have filed an involuntary petition in bankruptcy against the concern in the Federal District Court. The petitioning creditors are the Holbrook, Merrill & Stetson Company, M. Straulsaft Company and John A. Roeblings' Sons Company. It is charged that the company owes debts in excess of \$10,000. The creditors obtained an order to show cause, and a restraining order preventing sale, of the company's assets to satisfy a judgment of \$17,969.59 obtained against it by C. W. Strawbridge.

TRANSMISSION

MURPHYS, CAL.—The Burnsted mine will soon be equipped with an electrical hoist and work will be begun at once.

CROCKETT, CAL.—Work has been started on the new power station of the Great Western Power Company on the hills in the Bay Addition to Crockett.

OAKLAND, CAL.—Permits have been taken out by the Pacific Pipe & Tank Company for the construction of a sawmill, dry kiln, power house, etc., in Oakland, to cost about \$12,000.

LOS ANGELES, CAL.—Sealed bids will be received by the board of public service commissioners for copper cables

and wires in accordance with specifications on file in the office of the board.

COLVILLE, WASH.—The Stevens County Light & Power Company has petitioned the County Commissioners for a franchise to erect and operate electric transmission lines over certain roads in the county.

EUGENE, ORE.—The Comet Electric Company at Eugene has been awarded the contract for electrical work in connection with the erection of the Woman's Dormitory at the University of Oregon, Eugene.

VENTURA, CAL.—The Ventura Light & Power Company is constructing a distributing system at Semis, which will insure first class service both for light and power purposes. The new system will cost about \$4000.

RIVERSIDE, CAL.—The contract for the erection of electric transmission and telephone lines in connection with the Paradise Valley irrigation project in Butte County has been awarded to the City Electric Supply Company of Riverside.

TONOPAH, NEV.—Work has begun on the largest auxiliary power station in Nye County. The plant is to be constructed for the Great Western and Tonopah Bonanza mines, and will furnish power for operating all the machinery of those mines.

EVERETT, WASH.—The Commissioners of Snohomish County have granted the Everett Gas Company permission to erect and operate electric transmission lines over certain roads in the county in the vicinity of Snohomish for a period of 50 years.

BEVERLY HILLS, CAL.—The State Railroad Commission has granted the Beverly Hills Utilities Company, which furnishes electrical service in and about Beverly Hills, permission to sell its system to the Southern California Edison Company of Los Angeles, at about \$23,347.

YUMA, ARIZ.—An application has been filed with the city council asking for a franchise and right of way for a line of poles, wires and other conduits and conveyances for electrical energy along Gila street, by E. F. Sanguinetti and F. L. Ewing. The matter is to be decided at an election on July 19th.

HARLEM, MONT.—A company has been organized by local business men to establish an electric light plant. The company will be known as the Citizens' Electric Company and will be capitalized at \$25,000. R. G. Barton is president, J. M. Rantschler is secretary, and H. C. Anderson is treasurer.

FRESNO, CAL.—The San Joaquin Light & Power Company has been awarded a contract for the erection of a 250 h.p. reciprocating booster pumping station in the vicinity of Taft, Kern County. The station will be located about midway between Taft and Buena Vista Lake and will cost about \$50,000.

LOS ANGELES, CAL.—The board of education is receiving sealed bids at the office of the secretary of the board for the installation of all electrical work (electric switchboard and feeders) in the boiler house and ground of the new Los Angeles High School, at the Country Club Drive and Rimpau Avenue.

SAN DIEGO, CAL.—Two hundred and thirty-two acres of tide lands abutting on the Point Loma boulevard and 500 acres of tide lands in Dutch flats were turned over to the navy department to be used as a site for the marine brigade

post; \$600,000 is available for installation of sewage, water and lighting systems for the brigade post.

BOISE, IDAHO.—Extensive improvements are contemplated to the Swan Falls plant of the Idaho Power Company during the summer, involving an expenditure of more than \$500,000 and increasing the output by 8000 h.p. The company will also begin work this summer on the erection of an electric transmission line into the Jarbridge district.

GRANGEVILLE, IDAHO.—Plans are being made by the Grangeville Electric Light & Power Company for the construction of a dam and flume and power plant, to cost about \$75,000. The new dam will be built below the present dam, which is near Grangeville, and will develop from 1500 to 2000 h.p. The new flume will be 1500 ft. in length and will replace a flume 4000 ft. long. Eugene Enloe is president.

YOSEMITE, CAL.—Word has been received that Congress has appropriated \$253,000, the full amount asked by the Department of the Interior, for Yosemite National Park. This will provide sufficient funds to complete the new power plant this fall and continue the building of the new roadway connecting El Portal with the park. The power plant will have an output of 2000 kw.

PALMDALE, CAL.—Sales Manager G. B. McLean of the Southern California Edison Company, Los Angeles, states that electric energy for light and power will be available in Palmdale and the surrounding territory in the next 40 days. Actual construction of the work will begin at once. The power company will extend its wires from Lancaster along the section boundaries one mile east of the Southern Pacific tracks into Palmdale, and thence east to Littlerock with laterals sufficient to care for the various pumping plants in this end of the valley.

WENGLER, CAL.—The Pacific Gas & Electric Company is employing 108 men in its two camps in the Big Bend of the Pit. Just now the most important work is to strengthen the culverts so the five heavy auto trucks may haul in great loads of supplies and material. Two electric locomotives have been delivered. They will be used in hauling earth from the two header tunnels. An auxiliary power plant will be built in the Cove. It will have ample capacity to furnish all the power needed in construction work. The camp at Cove is growing slowly and a few families have arrived. Included among them is the family of C. Cogan, the superintendent.

ILLUMINATION

RENO, NEV.—Brown & Shearer have started an electric shop in this city.

LODI, CAL.—Efforts are being made to install electroliers on all streets here.

OSWEGO, MONT.—The local electric light plant is reported to have been destroyed recently by a tornado.

RIVERSIDE CAL.—The board of supervisors has voted to advertise for bids on new electric wiring in the court house.

LOS ANGELES, CAL.—The hearing on a petition for the formation of the Annandale Lighting District has been set by the board of supervisors for July 16th.

SAN JOSE, CAL.—San Jose is to have a new system of street lighting. The old magnetite lamps are to be supplanted by 120 new Mazda lamps of 250 candlepower.

PORTLAND, ORE.—Bids are being received by E. L. Coblurn, county clerk, Josephine County, Oregon, for the electrical fixtures for the new court house at Grants Pass, Ore.

RICHMOND, CAL.—Steps have been taken by the lighting committee for the installation of an electrolier lighting system on McDonald avenue, from First to Twenty-third avenue.

JEROME, ARIZ.—Cottonwood is soon to have an electric light and power service according to M. A. Farnsworth of the Arizona Power Company. The line will be built as soon as possible.

SAN DIEGO, CAL.—Congress has appropriated the sum of \$600,000 for the installation of an electric-lighting system

and other improvements on a site to be used for a marine brigade post.

EVERETT, WASH.—Bids will be received by Mae Weatherbee, County Auditor of Snohomish County, Everett, Wash., until July 16, 1917, for electrical work in the tuberculosis sanitarium.

LOS ANGELES, CAL.—Plans have been announced by the Los Angeles Investment Company for the construction of a number of colonial bungalows in Rodgers Park. A new street lighting system is also included in the new project.

REDWOOD CITY, CAL.—The Pacific Gas & Electric Company will shortly award a contract for the construction of a modern one-story class C office building which is to be erected on property in the business center of Redwood City.

ALAMEDA, CAL.—Work of installing electroliers along Webster street will begin in the near future. The wiring for the new system will be underground. The standards will be of 3-lamp design.

WILLIAMS, ARIZ.—The power house of the Williams Water & Electric Company was burned recently. Williams will be without electric lights and power until arrangements can be made to use the current from the mill. The loss is roughly estimated at \$100,000.

OAKLAND, CAL.—Sealed bids are being received by the board of library directors for furnishing material and labor for installing electric work in the construction of a two-story building to be known as the 23d Avenue branch of the Oakland Free Library, at the corner of East 15th and Foothill boulevard.

LOS ANGELES, CAL.—Plans are being made by the Hill Street Improvement Association for an ornamental lighting system which will follow along the lines proposed for the Broadway scheme. The advisory board of the association will meet later in the week to appoint a by-laws committee and to commence active operations.

SAN BERNARDINO, CAL.—This city is to be the district headquarters of the Southern California Edison Company, which recently absorbed the Pacific Light & Power Corporation, and the company will establish big offices at some point in the business district, not yet selected. It is probable that a building will be erected of which the company would lease a large portion.

COLVILLE, WASH.—The Stephens County Power & Light Company, a corporation, has petitioned the board of county commissioners of Stevens County, Washington, for a franchise to construct and operate a line of poles, with lines and cables to be strung thereon, with the transmission of electricity and electric energy for light along the following county roads. The Cottonwood road, the E. E. Burr road, the Stensgar road, the La Pray bridge road.

TRANSPORTATION

FULLERTON, CAL.—Construction on the Pacific Electric line into this city will start from this end at once.

SALT LAKE CITY, UTAH.—Work will start soon on equipping the Saltair, Garfield & Western Railroad for electrical operation.

LOS ANGELES, CAL.—The Pacific Electric Railway will extend its tracks to take care of any traffic problems due to the military camp being here.

SEATTLE, WASH.—The city council is planning to build the municipal car line to the Todd shipbuilding plant by August 15, providing that equipment can be secured.

SAN DIEGO, CAL.—An ordinance has been adopted by the common council granting the San Diego Electric Railway company a franchise to construct and operate a street railway upon certain streets in the city of San Diego.

SACRAMENTO, CAL.—John P. Coghlan, receiver for the Northern Electric Railroad Company, was in Sacramento and while here signed the contract for the construction of the freight wharf and shed which the company is to erect at West Sacramento. E. W. Book was awarded the contract.

TELEPHONE AND TELEGRAPH

WATSONVILLE, CAL.—The Pacific Telephone & Telegraph Company has applied for a franchise in this city.

TROY, IDAHO.—The Troy Rural Telephone Company has changed its name to the Troy Telephone & Electric Company.

FOWLER, CAL.—John Magill has been appointed assistant superintendent of line construction of the Fowler Independent Telephone Company.

COLVILLE, WASH.—The Pioneer Telephone Company a volunteer association, has petitioned the county commissioners of Stevens County Wash., for a franchise to use a portion of the Joe Martin road for the construction and maintenance of a telephone line.

PORTLAND, ORE.—The way was cleared for the reorganization and further expansion of the Home Telephone Company of Portland when Federal Judge Wolverton granted an application for receivership. The action is friendly, and is a technical step necessary to put the company on a financially sound basis.

OROSI, CAL.—The Orosi Farmers Telephone Company has reorganized and under the direction of J. W. McPherson V. E. Sloan, F. E. Cook, G. Reynolds and C. A. Evans, about \$4000 will be spent in rebuilding the lines. Besides the lines to be constructed connection will be made with a number of private lines into new districts east of Orosi.

SOCORRO, N. M.—The Mountain States Telephone Company is planning to run new lines south of Albuquerque, the present plan to give Socorro two circuits. Manager I. Sparks states that the material is now on hand for the reconstruction and removal of the local exchange into its new quarters on Park street and Garfield avenue.

EVERETT, WASH.—The Washington Coast Utilities, a corporation, has presented a petition to the county commissioners of Snohomish County, Wash, for a grant of a franchise to construct, maintain, etc., poles and wires for trans-

mission of electric current for telephone and telegraph purposes along certain county roads.

IRRIGATION

LASSEN, CAL.—It is reported that an irrigation scheme is under way whereby the high land of the valley, not reached by the other systems, may have water. McCoy Flat is the source of this system which is being promoted by Scott McArthur and Geo. A. Long.

FAIRVIEW, CAL.—The dam of the Price Irrigation Company, 12 miles from here is a total loss. All fears that there would be loss of life in the towns of Schofield, Helper, Castle Gate and Colton, in the path of the 11,000 ft. of water that were released in the break were dispelled with an announcement by the Rio Grande Railroad that its force of men, assisted by workers of the irrigation company, had taken hundreds of men, women and children to safety.

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LONG LIFE — LIGHT WEIGHT

Reliability

90 per cent of the Warehouse and Baggage Trucks, Electric Street Trucks, Storage Battery Tractors and Mining Locomotives on the Pacific Coast are equipped with EDISON STORAGE BATTERIES.

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Number 5090 —the New Insulator Design for 60,000 volts

This is one of ten new and improved insulator designs for different voltages that have put a new meaning into insulator strength.

For your reference library we have prepared a supplement to "The Insulator Book."

It definitely points out the advantages secured through these much-needed improvements in design and construction.

Write us for your copy before it slips your mind.

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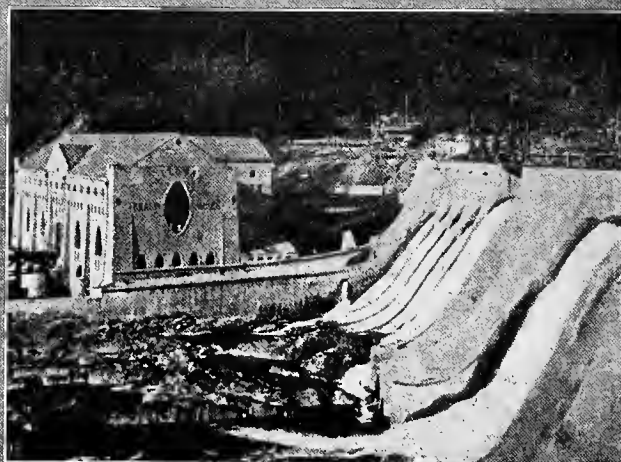


JOURNAL OF ELECTRICITY

VOL. XXXIX NO. 3

SAN FRANCISCO, AUGUST 1, 1917

PER COPY, 25 CENTS



Here is how Norway develops vast water powers for the manufacture of nitrates. The absence of these industries in the United States, even before the war, compelled us to send abroad annually some thirty-two million dollars

The West is Prepared

With its ten million horsepower properly developed, the West could supply sufficient nitrates and other necessities in the manufacture of munitions of war to man the armies of the world. In times of peace these selfsame industries could furnish the fertilizers for replenishing the soils and immeasurably forwarding countless other industrial activities of the nation. When the cry is heard on all sides for conservation of fuel, it seems almost a sacrilege that these vast natural blessings should go undeveloped. Read the editorial comment in this issue on water power legislation now before congress.

What Has Been Done in the West

Already the brave daring of engineers of the West has called into service over two-thirds of a billion dollars in electric power development and wonders have been wrought hitherto unaccomplished elsewhere in the whole world. In the eight states west of the Rocky Mountains there has been erected

The highest rock-fill dam.

The highest dirt-fill dam.

The highest dam of any type.

The longest span of aerial power lines.

The longest municipal tunnel for electric lines.

The longest submarine high power cable.

The largest single discharge turbine.

The longest system of municipal water supply.

The largest electrically operated gold dredge.

The greatest irrigation pumping project.

The second greatest system of impounded waters.

The first electrification of a transcontinental railroad.

The longest transmission system.

The largest system of hydroelectric distribution.

A host of the highest voltage long distance transmission systems.

THE EYES OF A NATION look to the West as the savior of the fuel situation and the West will not be found wanting.

Back East Excursions

SALE DATES:

August 1, 14, 15, 28, 29

September 4, 5

SOME FARES:

(Direct Routes)

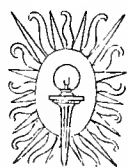
Denver, Pueblo	\$ 62.50
Omaha, Kansas City	67.50
Dallas, Houston, San Antonio	70.00
New Orleans, Memphis, St. Louis	77.50
Chicago	80.00
Minneapolis, St. Paul	84.45
Washington, D. C., Baltimore	116.00
New York, Philadelphia	118.20
Boston	120.20

Proportionately low fares to many
other points.

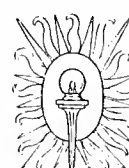
Going Limit—15 days; Return
Limit—3 mos. from date of sale
(but not later than Oct. 31.) STOP-
OVERS: Going—east of Calif.
state line; Returning—at all points.
See Agents.

Southern Pacific

Write for folder on the Apache Trail of Arizona



JOURNAL OF ELECTRICITY



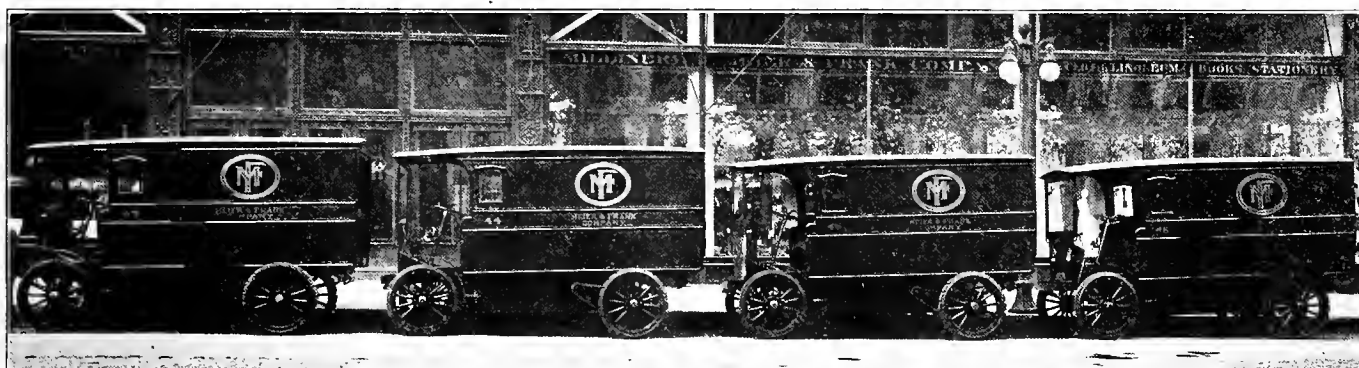
Devoted to the Generation, Distribution and Utilization of Energy

VOLUME XXXIX

SAN FRANCISCO, AUGUST 1, 1917

NUMBER 3

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Group of Electric Trucks for Delivery Service in Portland

A SUCCESSFUL ELECTRIC TRUCK DELIVERY SERVICE

BY F. D. WEBER

(Electric truck delivery, as an economic factor in a large department store of the northwest, has come to stay. Here is an excellent article that tells how this wide-awake company was not content with the gas or electric car upon the market and as a consequence evolved its own particular type best suited to its needs. The electric service is proving a success in every particular and the low costs of delivery should commend its use to other similar institutions throughout the West. Since the electric charging load is a very desirable one from the central station viewpoint, the data given herewith should prove very helpful to central station managers.—The Editor.)

In 1910 the Meier & Frank Company, owners and operators of the largest department store in Portland, Oregon, had 62 horses and 30 wagons to carry its free delivery service. In order to determine whether the system then in vogue was "balanced" or could be improved, an extensive survey of the system was made. The method of collecting data is shown by the "Analysis Delivery Sheets" No. (1) and No. (2), which are copies of the blanks used for the survey.

By means of this analysis the system was proven to be poorly "balanced" and a remedy found. Most of the drivers in the city districts were handling 4000 packages per month. Feeling that this was not what should be accomplished by the

men, the system was speeded up. Immediately the men began to complain of being overworked, and in order to overcome this discontent a "Bonus System" was initiated on the following basis:

For the first 1000 packages in excess of 4000, that is 4000 to 5000 per month, the driver received 25 cents per hundred packages. From 5000 to 8500, a bonus of 50 cents per hundred packages, with a maximum of \$20.00 bonus for any one month.

After this system was in operation a short time, the drivers no longer complained of being overworked and asked for larger districts. These same drivers at the present time are delivering 12,600 packages per month with two or three boys



THE TYPICAL ONE TON ELECTRIC TRUCK

Meier & Frank Co.,—Analysis Delivery Sheet

Date	Route	Sheet No.
Car or Wagon No.	Driver	
Time leaving store	Time returning	Total elapsed time
		hours min.
Stop No.	No. Pages	Stopping Time
	Traveling Time	Delivering Time
		Speedometer Reading
		Distance per Stop
		Miles 10ths Miles 10ths
		Location of Stops
		Condition of Road

ANALYSIS

	hrs	min	hrs	min
Time Leaving Store				
Time Returning				
Elapsed Time				
Time to and from route				
Time travel between stops				
Time for stops				
Time for meals				
Total of above				
Average time for stops				
Average no. pkgs per stop				
Number stops				
Number packages				
Distance to and from route				
Distance on route				
Total distance traveled				
Average distance between stops				
Rate travel to and from route				
Rate travel on route				
Cost per day				
Cost per trip				
Cost per package				
No. miles per gallon gas.				
No. miles per gallon lub. oil				
No. miles per kw. hour				

DATA FORMS

In order to gather systematic and accurate data on the comparative merits of electric trucks as opposed to the gas-operated car, this form was used by a well-known department store at Portland, Ore.

for helpers. During the month of March, 1917, twelve drivers received a bonus of from \$4 to \$20.

In March, 1910, one 800 lb. single motor type, panel body, Studebaker electric delivery car was purchased as was also one 1500 lb. electric car of the same type and manufacture. It must be remembered that the electric utility company did not promote the sale in any way, but that the Meier & Frank Company took the initiative itself. In May, 1910, two 1500 lb. double motor type, panel body Studebaker electric delivery cars were purchased and in November of the same year one 2000 lb. double motor type, panel body Studebaker electric delivery car, and one 2500 lb. furniture car of same manufacture and type were purchased. All these cars were equipped with Exide batteries and Westinghouse motors.

At the first the Meier & Frank Company did not have a charging set or maintain its own batteries but paid \$40 per month per car for maintenance and charging service. This was a very disastrous experiment and extremely unsatisfactory.

In order to get satisfactory service and maintenance the Meier & Frank Company installed a charging plant of its own at a cost of \$1500. This plant has proved highly satisfactory. The electric power is purchased for this plant at approximately 1½ cents per kw.-hr.

The charging plant is composed of one motor-generator set consisting of a 2300 volt, 60 cycle, 3-phase, induction motor, direct connected to a 600 amp. 130 volt, d.c. generator manufactured by the Westinghouse Electric & Manufacturing Company. There are enough charging panels provided so that all the machines can be charged at one time.

The electric cars which had been purchased up to this time were not specifically designed for the Meier & Frank Company's delivery service, consequently they were not thoroughly satisfactory. It was felt that an improvement upon their design could be made, hence the company undertook the building of 9 cars of its own design, in Portland, Oregon. These cars were called "Beaver Trucks." These trucks were all

equipped with Edison batteries, General Electric motors and built with "panel bodies." They were all of the single motor type, and were constructed as follows:

During the year 1911, two 1500 lb. and one 4000 lb. furniture trucks, during the year 1912 two 1500 lb. trucks, and during the year 1913, four 2000 lb. trucks.

The size of bodies for these trucks was carefully determined from experience. The bodies of the Studebaker trucks contained 162 cu. ft. and were not sufficient, consequently the "Beaver Trucks" were increased to 192 cu. ft. This size has met the conditions exactly.

The following method is pursued by the Meier & Frank Company in handling their delivery business. The packages are carried in gasoline trucks from the store to the garage, which is a brick building 100 ft. by 100 ft., three stories in height. At this point they are distributed into bins corresponding to the various city districts.

The city of Portland, Oregon, covers 67 square miles, and has 325 miles of hard surface pavement (about ¼ of the street being paved). The trucks deliver over an area of approximately 150 square miles. This district is covered from one to seven times a day.

One of the typical districts is shown in the illustration. This district is 2½ miles from the garage. The cost of operating one of the Beaver Trucks during the year 1916, while delivering in this district, including the following items of cost, such as driver's salary, helper's salary, bonuses, repairs, electric current, oil, garaging, delivery overhead, insurance, depreciation, interest, taxes and miscellaneous, was as follows:

Cost of Delivery

Total cost per year	\$3,125.56
Total number of packages delivered	85989
Cost per package delivered	3.6 cents
Total mileage covered	9129 miles
Greatest mileage covered in one month	760 miles
Total electric energy consumed during year	15600 kw.-hr.
Average cost per mile	1.7 cents
Total cost of electric current per year per car	\$175.50

The maximum number of packages delivered in a day during the year, 700 with 463 stops and 32.8 miles traveled.

The same car has made as high as 57.8 miles, over the same route delivering 492 packages, with 328 stops with a maximum speed of 17 miles per hour. The radius of operation is 50 to 60 miles per charge. The number of cells used is 65. The cells are of the A6 Edison type. During the year no cells were broken and none were returned to the factory for repairs.

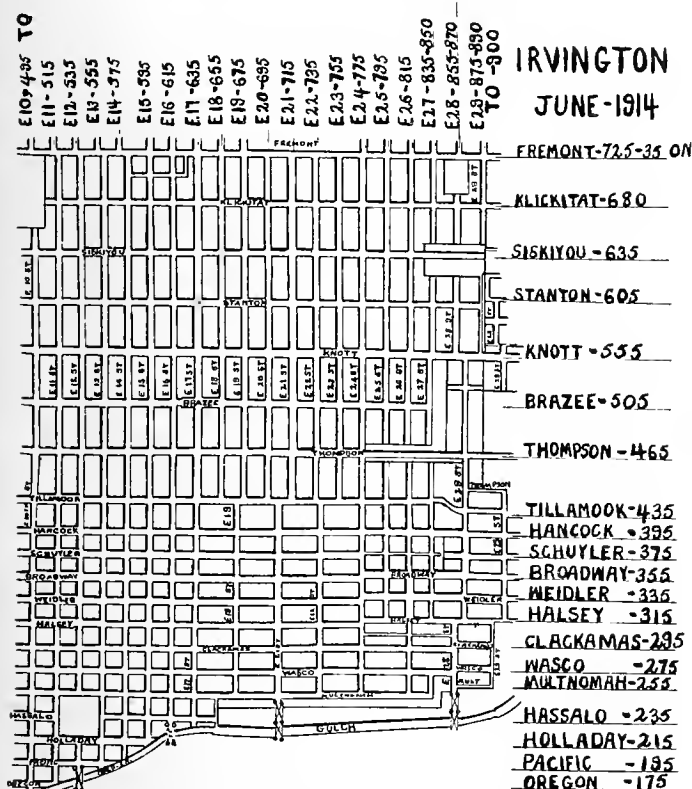
The regular crew on a truck is one driver and one helper, which may be increased to as many as three helpers. In the garage there is one day man and one night man for all the electric cars. The day man puts in part of his time on gasoline cars.

It is self evident that every delivery district has a different "package cost," depending on the distance from the garage, the size, road conditions and population.

The electric trucks have been entirely satisfactory and superior to the gasoline trucks, with one exception, and that is on muddy roads, where there is no pavement. The reason for this is that the electric trucks are limited in capacity. In other words, more energy can be carried in the gasoline tank of the gasoline truck than can be put in the storage battery of the electric. The electric can go through the mud just as well as the gasoline truck but lacks capacity.

Besides the trucks built by the Meier & Frank Company, there have been in the company's service over a dozen gas operated trucks of various designs and types, consequently an unusual opportunity for comparison has been offered.

The experience of the Meier & Frank Company is of great value as this company has approached the question of electric trucks with an open mind and has worked it out to its complete satisfaction.



DIVERSIFIED PROBLEMS OF CONTRACTOR AND DEALER

BY C. F. BUTTE

(Upon the proper solution of the diversified problems of the contractor and dealer depends much for the forward progress of the electrical industry as a whole. The recent convention of the California Electrical Contractors at Santa Cruz, Cal., was brim full of good things for the industry as a whole. Around this particular paper was grouped a noteworthy symposium of discussion in which representatives of the manufacturer, the jobber, the contractor, the dealer, and the central station took part. The result is that a clearer understanding and a healthier co-operative spirit is bound to exist among all branches of the industry in the future. The author is a member of the firm of contractors and manufacturers, known as the Butte Engineering and Electric Company of San Francisco.—The Editor.)

In the preparation of this paper covering the subject named, it will be my endeavor to treat analytically the various problems touched upon without drawing any specific conclusions, with the idea in mind that further discussions may materially aid and assist the drawing of correct conclusions and remedies for the many problems that should and must be corrected and solved.

Should I attempt to fully cover and analyze each and every problem met by the electrical contractor and dealer, I fear that you would have to extend the period of our convention, therefore, I will merely touch lightly upon many of them, omit many for some future time and endeavor to dwell upon the present day problems of greatest importance to the industry as a whole. It will also be my endeavor to treat individually each problem taken up, in order that some means may be evolved whereby results can be obtained and not merely a general discussion.

The Riverside convention of the Pacific Coast Section N. E. L. A. has shown that a general discussion by the various allied interests is invaluable and we hope the central station, the manufacturer and the jobber will also enter into the discussion today; mainly keeping in mind that a solution or a suggestion helping towards a solution will be more valuable than a ramification of ideas or arguments. I want to repeat again that it is not my intention to draw any conclusions in this paper and I hope that each one will bring forth some discussion, some suggestion, some idea that may mutually benefit the industry and if any one idea has been brought out by this paper that will benefit the industry as a whole, I will have felt that the co-operative spirit shown at the Riverside convention by the central station, by the manufacturer and by the jobber has been embodied in the preparation of this paper.

Education.—The greatest problem before any association, whether it consists of electrical contractors, dealers, jobbers, manufacturers or central stations is the education of its members. Education not in the sense of an academic learning, not in the sense of technical knowledge, not in the sense of literary achievements, but in the sense of ordinary every day methods and processes of carrying on our business in a uniform, stable, economical, efficient and profitable manner. Educating each other to consider and study the many problems entering into the multitude of items that our business involves. Educating

each other to foresee the many phases that arise during the daily routine of our business. Educating each other to properly classify each part of our business, properly conduct our transactions along legitimate business lines and foremost of all educating each other to raise ourselves out of the 200,000 class referred to in the reports of the Federal Trades Commission as follows:

SUGGESTED AIDS IN BRIEF

- Educate contractor dealers to a higher plane in business method.
- Contractor dealers must realize and appreciate valuable assistance offered them from central stations and jobbers.
- Contractor dealers must correct evils imposed upon them by some concerns.
- Contractor dealers must urge still closer ties of co-operation among themselves.

Two hundred thousand firms out of 260,000 firms engaged in business in the United States are merely eking out an existence; 100,000 of them have not

earned a penny. Only 10 per cent of the 200,000 firms know the actual cost of handling and selling their product, 40 per cent of them merely estimate their costs and 50 per cent have absolutely no idea of their cost, but merely haphazardly guess and establish their costs arbitrarily. Through meetings as we are holding at the present time in Santa Cruz, through meetings as were held at Riverside, through meetings as our various associations hold from time to time the membership and the attending representatives are rapidly gaining knowledge concerning their business affairs, rapidly elevating themselves out of the 200,000 class referred to before, but, how must we proceed to efficiently reach the firms and persons who do not take advantage of these meetings, how are we to promulgate the essentials of a successful business, how are we to cope with the 40 per cent and the 50 per cent class previously referred to in the Federal Trades Commission report, many of whom, will not, cannot and do not mend their ways, correct their own evils nor gain any knowledge from the experience of others without the knocks of bankruptcy falling upon their heads, incidentally of which there were 22,000 in the last year.

Will not some genius with an intuitive, initiative and instinctive mind help us to remedy this situation?

Estimating and Costs.—The purpose of conducting any business or project is to make a profit and the only way to make a profit is to sell something for more than it costs. Consequently the first essentials of any business house is to know the cost and that an accurate determination of cost is closely related to efficiency and proper business methods. Primarily costs consist of three elements, namely, material, labor and expense. In our contracting business, the first two elements, material and labor, must be determined by proper estimating methods whereby these two elements can be properly and correctly computed from

the plans and specifications. It appears that a proper, consistent, uniform and universal method for the computation of material quantities has not been formulated as yet and this question alone is broad enough to justify an individual discussion. Many times have we noted a wide variance in the quantity of material on the same plans and specifications in comparing the quantities given by various estimates. Why should this condition exist? Is it possible for one estimator to elongate the conduit to make up for the shortage in lengths? Is it possible that another estimator will carelessly compute longer distances than required? Is it a fact that some estimators use a two foot rule, others a linen tape line that invariably is incorrect, is it a fact that some estimators use a cheap 36 in. steel tape line and do other estimators use a rotometer which accurately measures distances either in a straight line or a curve, in order to compute the lengths of the conduit or wire runs? An error on the part of the estimator when computing distances in the first instances effects the entire cost of the contract as the same distances are used to compute the lengths and quantities of other essential materials.

The second element of cost, namely, labor cost, is also an item not uniformly or consistently handled. What is the best practice for handling this element? Is it most efficient to estimate the labor costs on a unit foot basis? Is it better to estimate the labor cost on the unit floor basis? Is it advisable to lump all items together and figure on the basis of so many days of labor for the job? Is it proper to figure the labor and material costs on the basis of outlets or circuits?

We now come to the third element "Expense." Although this element has been discussed continually, although continued emphasis has been placed upon the absolute necessity of including this element in cost, many careless, inexperienced, inefficient business men or rather unbusinesslike men, persist in disregarding this element. How can it be possible that any man will believe that the many items entering into this expense element are not a part of his cost for doing work? Essentially a proper method must be devised for handling this element and unless a contractor and dealer appreciates the existence of this element he will find that he has been operating under a gambling proposition and fortune sooner or later will be harsh with him. However, while he continues to disregard this element he is a disturbing factor in the industry and does injury not only to himself but to his fellow competitor. Oftimes have these items that constitute the third element of costs been recited, however, I would feel that I have been amiss in my duties if every opportunity is not grasped to repeat them again. Generally the third element of cost or overhead expense consists of the following:

Advertising.	Drivers' pay-roll.
Association dues and subscriptions.	Executive expenses.
Attorney fees.	Entertainment expenses.
Automobile maintenance and supplies.	Freight, expressage and cartage not chargeable to jobs.
Bad debts.	Interests and discounts.
Commission not chargeable to jobs.	Insurance.
Clerical and bookkeeper's pay-rolls.	Light, power and heat.
Defective work and repairs not chargeable.	Office supplies.
Depreciation of stocks and equipment.	Periodicals, newspapers and reports
	Postage stamps.
	Printing and stationery.
	Preliminary expense on jobs not secured.

Rent.
Stockroom miscellaneous supplies.
Superintendence not chargeable.
Stock wastage and losses.
Stockroom pay-rolls.

Taxes.
Telephone.
Teiagraph.
Roof repairs and losses.
Wagon repairs and maintenance.

The proper method for handling these various items in order that each and every contract carries the correct proportion or percentage of the third element must be devised. Again we have reached another item that will justify an individual discussion. First, how the third element of cost shall be computed; second, how the non-progressive business man can be made to realize the importance of this element, and third, how shall we proceed to educate the owners and architects that this item is a legitimate part of the cost of work and at what proportion to the total of the first and second element does the third element exist? Only by the determination of the proportion of the third element to the total of the first and second elements can we derive the actual cost of the work and only then can we talk profit, the reason for which we are in business and the only reason.

While I have spoken of the proportion of the third element to the total of the first and second elements of costs, it must always be borne in mind that the per cent of overhead expense is always based upon your gross annual business and never on your net cost of the first and second elements.

Will not someone carry these ideas further and enlighten us more on these vital elements, namely, first, material; second, labor; third, overhead expense and finally the only reasons for our being in business—profit.

Trade Discounts.—What is a trade discount? How many contractors have endeavored to solve the problem of obtaining orders from the consumers when the consumers can purchase electrical materials at the same price or nearly the same as an electrical firm. How many electrical contractors and dealers have solved the problem of obtaining orders from industrials who manufacture boilers and water heaters, who manufacture water wheels, who manufacture steam engines and tractors, who manufacture and fabricate steel bars and beams when these industrials extend their electrical equipment which in no way directly enters into their output? How many wholesale dry goods houses sell direct to the consumer at trade prices? How many wholesale shoe houses sell direct to consumers at wholesale prices?

Then why in the name of good business, sound reasoning or justification, should the electrical industry or rather the contractor dealer end of the business be pitted against such conditions? Why should not a trade discount be maintained? Do we see many electrical wholesalers with the sign "Wholesale Only" or "To the Trade Only" such as we daily see in any number of other lines of business? What must be done to make it possible for the contractor dealer to obtain the business he should have on his books? Is it the elimination of promiscuously extending trade discounts to the general users and consumers? Or, must the contractor dealer purchase his materials at a lower price in order to be in a position to obtain some of the existing business at the present prices?

Something must be done—something will be done

and something can be done. Cannot some one bring forth a solution for the conditions existing at the present time and mutually benefit the several branches of the industry? We know that the cost of manufacturing an article is practically a fixed quantity. We know the manufacturer has practically a fixed overhead charge in the operation of his plant? Do we know whether the manufacturer has a fixed cost for the selling of his product? Do we know whether the manufacturer is not duplicating to a great extent the same selling expenses that the jobber has to incur? Do we know whether the cost of placing a manufactured article in the hands of the contractor dealer is not excessive on account of the possible duplication of selling expenses? Should not the manufacturer eliminate some of his selling expenses and allow the jobber and dealer a greater margin between the fixed manufacturing costs and the price at which the consuming public will purchase the material and apparatus? Would it be possible to maintain the present industrial prices and the jobbers allow the dealers and contractors an additional discount over and above the present prices if the manufacturer would eliminate whatever duplicate selling expenses may exist? Do we not receive catalogues and literature covering identical materials both from the manufacturer and jobber? Do we not oftentimes have visits from the manufacturer endeavoring to sell his product and then purchase the same product from the jobbers? Are there not many other ways by which the selling expenses are doubled? Why cannot the manufacturer eliminate these expenses and sell his product through the jobber without incurring duplicate overhead expenses, thereby cutting down the original costs and the ultimate price to the contractor-dealer; permitting the contractor dealer to obtain considerable more business at the present prices and at a reasonable margin of profit? Is there any reason why a solution is not possible?

Standardization.—Standardization is the keynote of success of any industry or undertaking. The application of standardization to the electrical industry has aided the manufacturer to produce higher grades of materials at correspondingly lower costs, has enabled the central station to utilize many of its resources to greater advantage, has assisted the contractor to undertake a greater volume of work without increased efforts, in fact one cannot point to any single instance wherein the application of standardization has not materially aided and benefitted the industry. The entire engineering ability of our country is now endeavoring to standardize all products and uniformly establish interchangeable parts. The automobile engineers and builders are endeavoring to standardize all parts of the automobile truck for use in the U. S. Army. The board of engineers of the United States are endeavoring to standardize the various parts of the steel merchant vessel our government intends to build and so on we hear and learn of the many industries standardizing their producers and output. What is the electrical contractor and dealer doing towards standardization? Can we not go further in the work than we have? Can we not standardize our method of estimating electrical work? Can we not standardize our

method of construction? Can we not standardize materials and specifications and the many integral parts of our business?

Plans and Specifications.—How often do we come in contact with plans and specifications that are really complete in all essential details? How often must we practically lay out the entire work merely to estimate the requirements of the plans and specifications? Many present today can answer these two questions far better than the speaker and it appears to me that a wide field of good endeavor is open on this one subject. How many of you have ever seen a plan that shows the location of the service entrance or point to which the lighting and power feeders should be brought? Do we often receive plans and specifications that specify the sizes of feeders and sub-feeders? How about the plans that rarely show any branch circuit arrangement?

Do all really appreciate the amount of time and expense that would be saved to the many estimators if all plans were made to show the circuit runs, sizes of sub-feeds, size of feeders, location of lighting and power services? I would venture to estimate that 20 per cent of the entire collective estimating expense of the electrical contractor is expended in laying out information that should be originally shown on the plans. Bear in mind that each and every estimator must lay out the same work for the same job that they may be figuring and on the basis of six to eight bids on a job no further argument need be applied to prove that more complete plans are absolutely necessary. Aside from the time that may be saved, uniformity of construction and estimates will follow, when plans are really electrical plans. How can we bring this condition about?

Efficiency.—Following the lines of standardization and more complete plans and specifications we daily meet the problem of efficiency. Professor James Harvard after careful research states that the average man uses only 10 per cent of his mental ability and only 10 per cent of his physical power. Does it not follow a statement of this kind that we must apply our mental and physical power efficiently to accomplish what we aim to do? Are we carrying on our business affairs efficiently or can we gain further advantages if we watch ourselves more closely? Are not most failures due to man's mental and physical inefficiencies? Wherein can our industry gain by greater efficiency? I will willingly leave this subject open to you for further discussion and consideration with the fond hope that you will point out many ways whereby we can mutually gain.

Engineering Problems.—Under this heading I can hardly look upon any of the activities of a live contractor without drawing the conclusion that all of our problems dealing with our work would come under this heading. In my endeavors to cover this particular section I will practically begin with the first problems we meet and continue therefrom.

Engineering knowledge in the first sense is absolutely required to understand the fundamentals of the National Electric Code and to correctly interpret the requirements thereof. The interpretation of the

Code must be the guiding hand of any successful contractor, in view of the fact that all electrical installations and electrical materials must conform to the requirements thereof. The electrical code should be a Kent, Trautwine or Foster to the electrical contractor. The Industrial Accident Board's safety rules and the local ordinances pertaining to our work also contain many engineering problems in their interpretation.

The contractor must thoroughly understand plans, elevations and cross-sections, must thoroughly understand the many types and classes of building construction and also have knowledge of the processes of building construction work in order to correctly estimate his work, efficiently plan his operations and economically complete whatever contracts he undertakes. He must design and construct many pieces of apparatus and equipment to fulfill the requirements of his contract and oftentimes apply his engineering knowledge and ingenuity to profitably complete the work in hand. The problems the contractor nowadays meets extend forty feet under the mud and 60 feet or more in the air. We undertake submarine work, we undertake underground work, we undertake aerial work and we undertake innumerable indoor installations. We undertake electric range work, signalling apparatus work, indoor and exterior illuminations, power and lighting generating installation, industrial and manufacturing equipments, power and lighting and telephone transmission installations, marine and steamship equipments, heating and furnace apparatus, and in fact I dare say very few applications of electricity exist the present day that a live, progressive and efficient electrical contractor does not meet in his daily endeavors, all of which require engineering knowledge and embody engineering problems. In addition to these problems he must also be a mighty good financial engineer to carry the many projects and undertakings to a successful conclusion.

He must be in a position to serve his customer well whenever he is called upon to give the costs of operation of an industrial plant, he must be able to talk intelligently on rates and consumption, he must be able to correct and remedy defects and damages that may have occurred, he must be able to recommend types and classes of apparatus and equipment most efficient and economical to perform the functions required, he must be able to argue load factors with the officials, he must be able to conduct himself intelligently in all matters pertaining to electricity.

The contractor must have some knowledge regarding the characteristics of metals, as many times he meets problems involving questions of conductivity, resistivity, magnetism, tensile and torsional stresses. He must understand at least elementary chemistry, as many classes of equipment involve chemical problems. In fact the present day demand made upon a progressive energetic electrical contractor requires a broad engineering knowledge to successfully and efficiently fulfill his place in the electrical industry.

Finally.—As I have previously stated I would not attempt to cover all the problems we meet in our branch of the industry and while I may have touched upon many of them, the number I have not touched

upon will leave a great many subjects for future discussion.

However, in closing I wish to draw a few conclusions:

We must find some means whereby we can train and educate all contractor dealers to a higher plane in their business methods. We must find some means whereby we can make the contractor dealer realize and appreciate the valuable assistance and the possibilities of expansion that is offered to us by the central station and jobbers.

We must find some means whereby we can correct universally the evils imposed upon us by some concerns and finally we must energetically, effectively and persistently urge each and every non-member to join the California Association of Electrical Contractors and Dealers, become a part of the activities of the electrical industry, help to build up and expand the field of application and derive the benefits always forthcoming in any real live active and efficient electrical organization.

IS THE REGULATION OF PUBLIC UTILITIES A SUCCESS?

In an address brim-full of high and lofty ideals, E. K. Hall, vice-president of the Electric Bond & Share Company of New York expressed his views recently on the subject "Is the Regulation of Public Utilities a Success," and in summarizing his points, thus warned the three parties involved in this present day problem—the public, the utility and the commission:

In closing, I would say a word to each of the three parties to this regulation proposition. It is only by co-operation of the three parties that there is going to be success, and that success is both to the well-being of the companies and of the communities served. The companies must lay all of their cards on the table, and educate, educate, educate; get the facts out before everybody; go the limit, half way always and generally more than half way. The public should protect their commissioners; give them every kind of an opportunity to do their job as they want to do it. Above all, make them independent.

I would say just one final word to the commissions. The destructive, punitive period of regulation has just about gone by. The great constructive period is just about coming in. You have spanked the boys; you have spanked them hard; there are some of them a little bit sore; they are trying to do the best they know how; they are doing pretty well. How would it be if you should pat them on the back, take hold of their hands, and help them build up the service of the future? Tell the neighbors they are pretty decent boys, after all; that they are trying to do the job, and give the service, and it isn't really as easy as it looks. Join hands with them; go ahead with them into the constructive era that is just ahead, and I will guarantee you will enjoy the constructive period far more than you have the punitive period, and you will have more fun on the job than you ever had before, and 99 per cent of the public and all the companies will come in behind you and stand by you to the limit.



The Gold Dredging Fields of California

ELECTRICITY SUPREME IN GOLD DREDGING

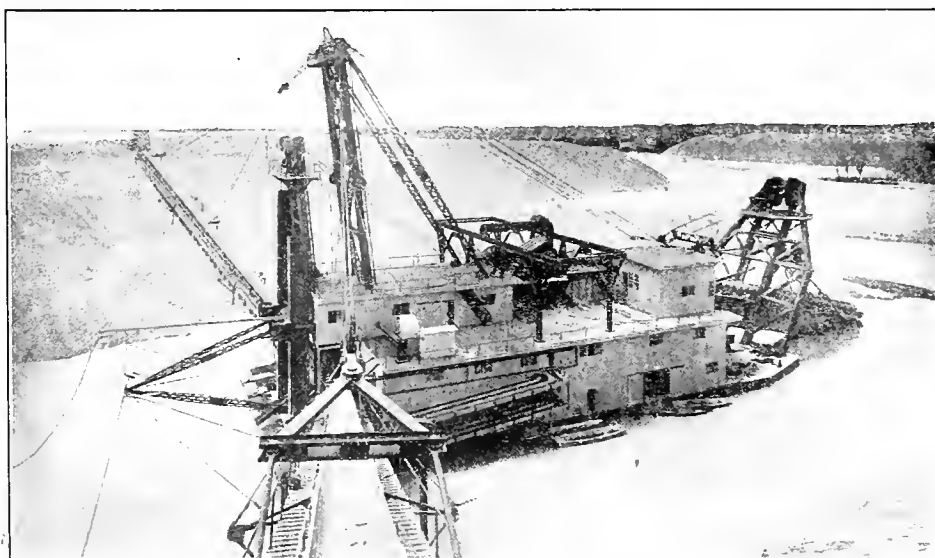
Gold dredging has for some years been recognized as one of the substantial industries in which electricity plays a most important role. In the *Journal of Electricity*, July 11, 1916, appeared an article entitled "The Most Powerful Gold Dredge Afloat." This dredge is known as Yuba No. 15. But agreeable to the old adage, "The old king is dead, long live the new," the wonderful record of Yuba No. 15 has now been superseded by Yuba No. 16.

This new steel clad monster, electrically operated throughout, not only performs the function of washing the gold from the gravel, but also digs a channel and protects it by the construction of retaining walls. To make this possible it is built with two independent stackers, by which the waste material may be conveyed to the sides of the dredge, instead of behind it, as is usual. The illustration shown is taken from the end of one of the stackers. To gain an idea of the immense

water. Three men operate the entire dredge, which digs and extracts the gold from 15,000 tons of gravel each day. The cost per ton for digging, extracting the gold, and stacking the waste, is only about three cents per ton. The total weight of the dredge is about 2500 tons.

The electrical equipment is practically the same as that described for Yuba No. 15, in the *Journal of Electricity* Nov. 11, 1916. A total of nearly six hundred horsepower in installed motor capacity is necessary for its operation. The constant increasing uses of electrical energy in the gold dredging fields of California is a source of great satisfaction to men of the electrical industry.

The installation has been made by the Yuba Manufacturing Company which has its headquarters in San Francisco.



Yuba No. 16, the Newest and Largest Gold Dredge, Electrically Operated Throughout

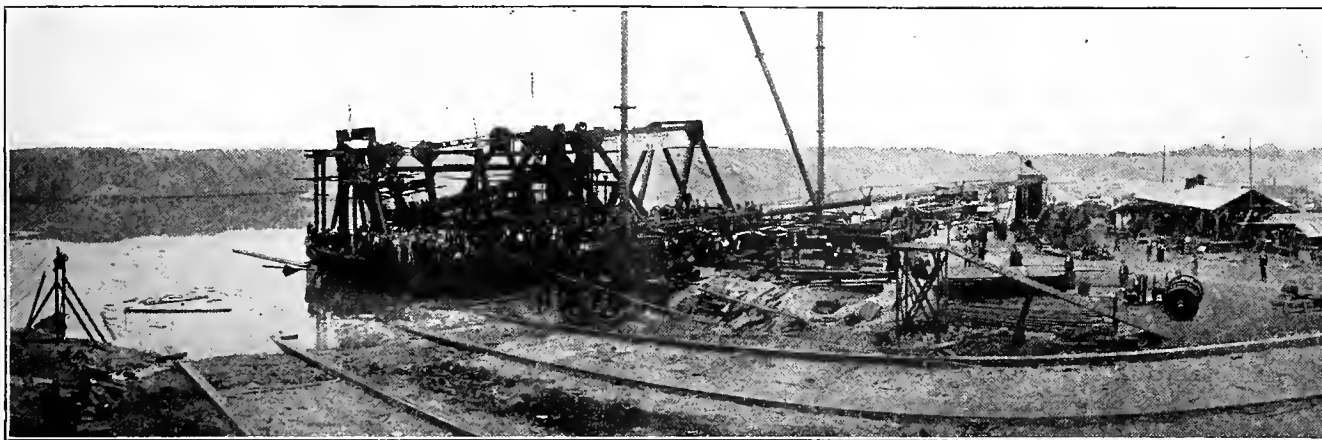
size of the machine, which cost over \$600,000, it may be stated that it is 417 ft. to the end of the other stacker. Its 100 manganese steel buckets, each holding 18 cubic feet of gold-bearing gravel, dig 82 ft. under

prises liquid credit instruments, and not open accounts which are valueless in times of pinch and can only be used, generally speaking, at high rates of interest if borrowed against.

The Increasing Value of Liquid Credit Instruments

An extract from a general letter of the National Association of credit men is interesting at this time of necessary credit expansion:

No thoughtful student of conditions will fail to recognize that the flotation of large public loans made necessary by the exigencies of war is likely to cause pinch no matter how earnestly we strive for that equality of distribution which our organization is advocating. The need of large credits is now evident, and this may be supplied if there were available with business enter-



showing the Yuba No. 16 Under Construction

NIGHT FREIGHT HAULING BY ELECTRIC RAILWAYS MAY LOWER COST OF LIVING

Night freight hauling by electric railways can be made a material factor in reducing the cost of living, according to Henry L. Doherty of the banking firm of Henry L. Doherty & Company, and he has instructed the managers of the various cities service traction properties to investigate the proposition as related to their local conditions.

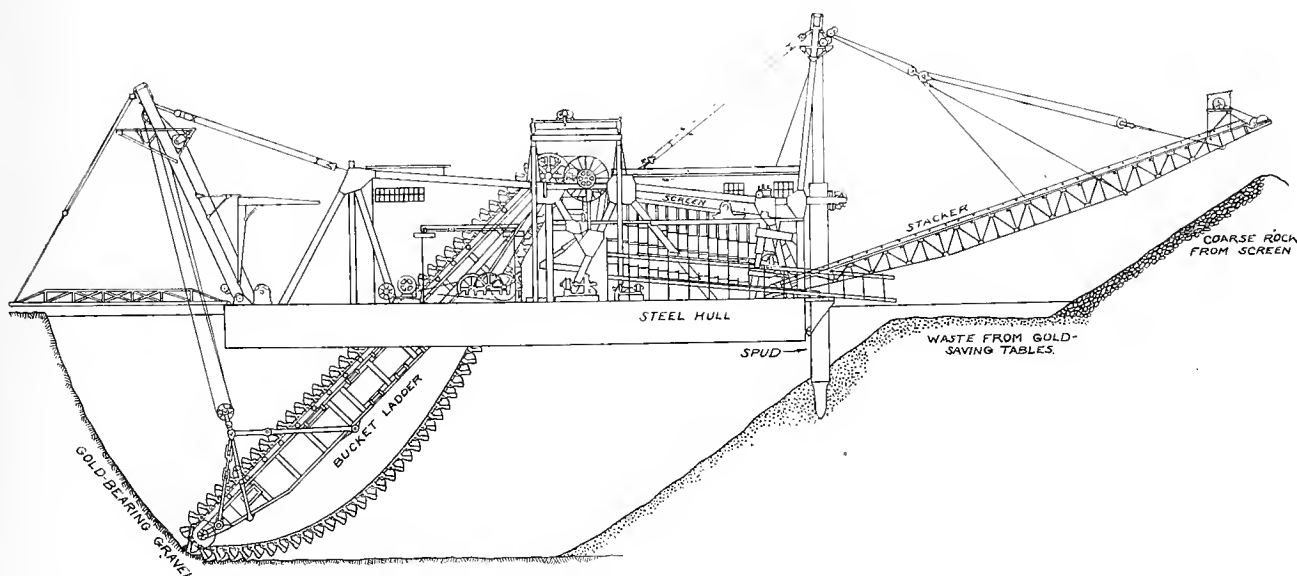
Mr. Doherty recently returned from extended visits to Toledo, Kansas City and other middle west points, convinced of the feasibility of his plan. The primary move to make the idea a success, he thinks, would be the starting of an extensive educational advertising campaign in each city available, which would tend to show the public the benefits of the innovation, and consequently pave the way for legislation necessary to amend franchises not permitting this form of traffic.

Much of the high cost of living today is due to crudity in transportation methods, necessitating too

much handling of each load, Mr. Doherty thinks. Two principal points involved are the hauling of food from the farm to the railroad, and its subsequent transport from the city terminal to the city buyer. Mr. Doherty uses potatoes as one example.

FUEL COSTS AFFECT PACIFIC LIGHT

The Pacific Light & Power Corporation, operating in Los Angeles and vicinity, for April and the four months ended April 30 reports increases in both gross and net earnings, compared with the same periods in 1916. Gross in April was \$276,191, an increase of 7.96 per cent, and net \$177,981, an increase of 3.45 per cent, with operating expenses up 17.22 per cent. The same tendency in earnings is reported for the four months and the increase in operating expenses is due to the unfavorable fuel situation existing around Los Angeles, where the shortage in both coal and oil has resulted in prices as much as double their normal quotations.



SECTIONAL VIEW, SHOWING THE PRINCIPLE OF OPERATION OF THE GOLD DREDGE

Here may be seen how the huge buckets of eighteen cubic foot capacity scoop up the gold bearing gravel, eighty-two feet under water, and dump it upon the revolving screen. This screen, washed by huge jets of water, deposits the worthless gravel upon the stackers, which convey it either to the rear or else for a retaining wall in the stream channel. The gold being very heavy, after passing through the screen, is caught by the mercury and riffles placed in the gold saving tables as the fine material is washed on down in its journey to the waste heap in the rear of the dredge. All equipment throughout is electrically operated.

RETAILING AND MERCHANDISING

BY LOUIS LEVY

(Better progress in retailing electrical appliances is a subject of prime interest to the contractor and dealer whether situated in the large or in the small city. Here is an excellent paper on retailing and merchandising that should prove unusually helpful to both these classes of men. The author is owner of the Levy Electric Company of San Francisco and sets forth in this paper many of the leading principles that have attained success for him in the electrical business world. The paper was read at the recent Santa Cruz convention of the California Association of Electrical Contractors and Dealers.—The Editor.)

It is a fact that most of us dealers, when starting in business, begin with a limited capital but with a practical experience which is necessary for the building up of an electrical contracting business. It seems natural that the construction end of an electrical business should be the bigger end and in my judgment, it will be quite a number of years before a merchant will consider investing for his own account any volume of money in a store and fittings for the sale of appliances unless he has had previous experience in the electrical business.

It may be that with the association work and the assistance of the jobber and central stations that we dealers will be put in a position to make sufficient money to create a better impression of the electrical business, but at the present time there is not sufficient volume nor sufficient profit to make the business worth while to business men looking for openings to go into business.

As conditions are now, the electrical dealers make a beginning in a small way as a repair man or contractor and with his stock more as a necessary adjunct to his contracting business than as a retail proposition. The fact that a store room must be rented and someone must answer the telephone, has been the temptation to have a place where goods might be sold at retail and to my way of thinking these beginners in the retail business, are the ones the association must encourage as much as possible.

To do this, one of the most vital things to furnish him with is a price list of standard articles. Articles that are household necessities, and which are the mainstay of our cash receipts each day. This price list should be a ready reference and should be figured on a basis that will permit a small buyer a profit over his overhead.

Our association should take the lead in furnishing our members with this list and also go further and give non-members and non-electrical houses the benefit of this work, for there is nothing better than having the re-sale prices on standard articles the same all over, and the non-electrical houses, I believe would be only too willing to follow a price that is issued from an organization composed of the legitimate dealers such as ours.

A new beginner in the electrical business needs every encouragement to join in association work and it seems to me that our association would be doing a good work, if every new man in the business was given a paid-up membership for six months or a year, so they could see for themselves the advantages of associating with us and learning from their competitors.

Inasmuch as every distributor of electrical appliances is of assistance to the central station, they in a spirit of co-operation should publish a list showing the different dealers and contractors who handle electrical goods,—if necessary, head the list with a line disclaiming any responsibility for the reliability of the different merchants named.

Merchandising of any goods requires capital, and capital for a new beginner is only acquired by saving, so it appears to me that a new beginner in the electrical business at the present time, is the exception when he starts in with capital sufficient to open up as a real retail merchant. All we can expect is for the average new beginner to learn by experience and when it comes to maintaining a clean store, bright show windows and up-to-date stocks, I believe that the association should maintain an expert whose business it would be to travel over the territory and make suggestions for the improvement of our establishments, and particularly the new beginners.

The foregoing remarks, I have made in the hope that the discussion which is to follow the reading of this paper will bring out the facts as to whether it is practical for us, with the assistance of the other interests of the business to put these ideas into practice.

I will now tell of some experiences in conducting my business which will apply more particularly to the small dealer whether he is located in a city or town.

I have found that it pays to continually show Mazda lamps and that considering turn over, the Mazda lamp is the most profitable item I sell. I find that I do not have to give any time to selling lamps as people are already sold before they come into the store, but I make use of what I call "shocking machines" which are always in my door way and which are the means of reminding people that we have lamps for sale.

I have separate drawers for the different sizes of lamps and have them already wrapped in packages of 6, 5, 2 and one. I find that makes for quick service and saves the necessity of testing every lamp that is sold and gives one an opportunity for enclosing advertising matter in each package delivered. At times, we are asked to test the lamps but we make a practice of replacing any that are returned within a week, that the customer might claim was broken, and in this way, avoid the necessity for testing. Again we find that people will order ½ dozen and if we stop to wrap them and they find that only 5 come in a box, they will change their order.

In replacing lamps which are claimed as defective, I find that it's the exception when we are imposed

upon and that it pays to replace quickly, any broken lamps, even though I have to stand the loss myself.

Along the same line, I make it a practice to refund money on return of goods within a reasonable time and as a closing argument on landing a sale, nothing is better than to offer to refund the money after a week's trial of the appliance.

You perhaps know that at the present time, my place of business is located in a residence section of the city and not down town. Mention is made to bring out the following facts. I have tried my best to get general business from all over the city and have come to the conclusion that we must look for the best retail business within a radius of perhaps fifteen (15) blocks of the store and not expect to get any volume from elsewhere. While in 1916, I sold over \$20,000 worth of goods at retail, I find that I am increasing business by concentrating my advertising and efforts to the neighborhood of the store.

For your information, I would say that in 1916 I tried to put out salesmen on house to house canvassing and spent considerable money for business this way. I have also spent money on printed matter advertising my own business and distributed in my neighborhood as against paying for the distribution of the advertising matter furnished by the National Advertisers. I believe this has paid, although the cost of doing this was so much that I could not afford to keep it up.

I might add here that I make use of the matter furnished by the National Advertisers, but always feel that I would like to see the day when the style of the matter furnished us will be changed so that our business will be given more space than the one inch or so that is allowed for our name and address.

My neighborhood has brought me considerable business in the way of repairing appliances, and I would like to bring out the fact that this is one part of the business that we can hold on to because we can handle it better than the hardware shop, grocer or drug store. This part of the business, however, requires prompt service. It means when a woman's iron is out of order, that it must be repaired at once and not left for two days before she can have the use of it. The same with the percolator, toaster, vacuum cleaner, etc. I am in a position to promise the return of the article within a reasonably short time and where there is likely to be delay, I make it a practice to loan the lady another iron or appliance. I always, however, agree on a price for the repair and never take any chances on a disagreement after repairing.

In this connection, I find that most of the standard articles can be repaired without much trouble, as the manufacturers have made the provision to have the extra parts in stock, but from experience we learn which manufacturer is not equipped to give us the service that our retail trade requires and it is this experience that we use in not boasting the sale of these particular appliances.

Another profitable part of the retailer's business, is the sale of used appliances and the rental of appliances. I made it a rule to have a rental price on

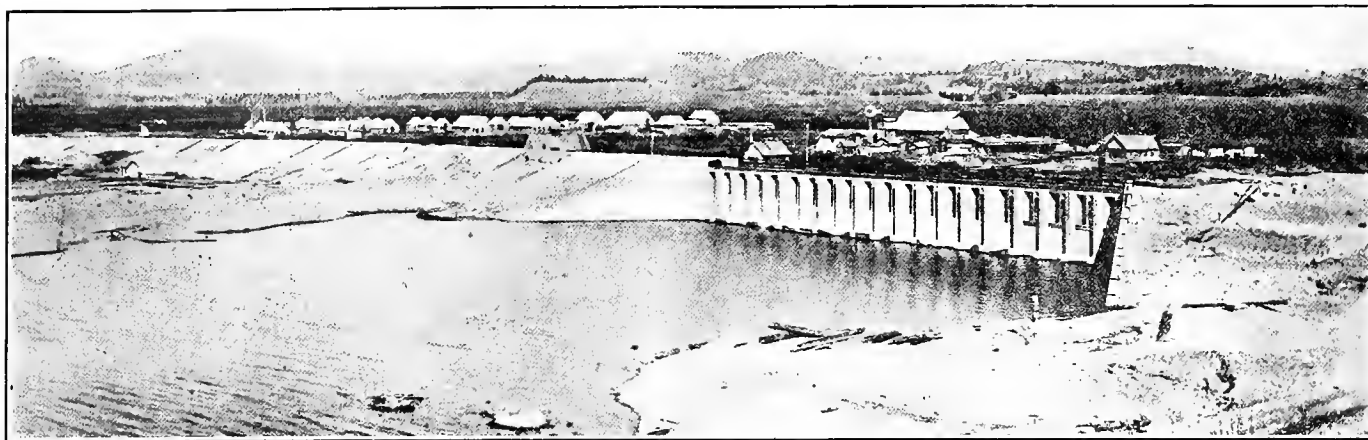
everything that one would want to rent. Necessarily, the charge is sometimes high, but nevertheless, I have a rental price and I believe that it is good business to always be prepared along this line. I also find that used irons and appliances can always be sold in my neighborhood provided one is prepared and informed of what can be procured.

In furthering my business, I have taken considerable interest in an improvement club that is operating in my neighborhood, being one of the executive committee. I have also served on most of the important committees that have been appointed during the past year and while this all takes time, it certainly pays a retailer to get acquainted with his neighbor, especially as I stated before, I feel that I must look to my neighbors for all my business.

I would also like to bring out the fact that I believe that I am getting considerable business from so called industrials in my neighborhood because I can give them better service than they can get from the jobbers who have been getting most of their business. I do not hesitate to tell these people that I cannot compete on price but I manage to give them retail service which they are apparently willing to pay for up to a certain limit. I would state, however, that this business at the present time, is not secured at the full retail price. In handling this business, I do not employ any outside salesmen, depending on business coming into the store, and occasionally sending out circular letters to a selected list.

I have found that charge accounts pay and also that it does not pay to question too closely, the opening of new accounts. I have records to show that my losses from bad accounts averages $1\frac{1}{2}$ per cent and from the best sources of information, this ratio of loss is reasonable. The average sales to customers will not be over three a year, and the expense of investigating the credit standing of a customer is out of proportion considering the profit on the account, so that I am very liberal in extending credit. Of course, I have some accounts that have been buying of me for over ten years and there never is a question as to payment, then again, there is the transient apartment tenant that expects to pay cash for everything, but might buy on the installment plan, if it were suggested, and this is the customer that it pays to take a chance with.

All in all, I believe that our retail business opportunities are getting better and better and that if there were more dealers in it, concentrating on retailing only, that the public would patronize the specialty shop more and more and that in time, with the increase in the number of specialty electric shops, the hardware shop, grocery and drug stores will find that it does not pay them to handle our line of goods. By this, I do not mean that the goods will be bought at lower price from specialty shops, but that by honest and conscientious business dealings, and a more thorough knowledge of our business, the electrical retailer ought to, and will be able not only to hold his own, but forge ahead so that in time, the main retail sections of all towns and cities will have retail electrical stores;



The Jackson Lake Dam of the Minidoka Project

PUMPING PLANTS OF THE U.S. RECLAMATION SERVICE

BY S. T. HARDING.

(Unit costs for electrical pumping are of vital importance in economic application of electrical energy to the great arid districts of the West. Seldom has this information been available for comparative study. Here is an excellent article on comparative costs of raising one acre foot of water through a height of one foot, compiled from the exhaustive records of the U. S. Reclamation Service. The author is a well-known irrigation investigator in the faculty at the University of California, who formerly was an engineer in the Reclamation Service.—The Editor.)

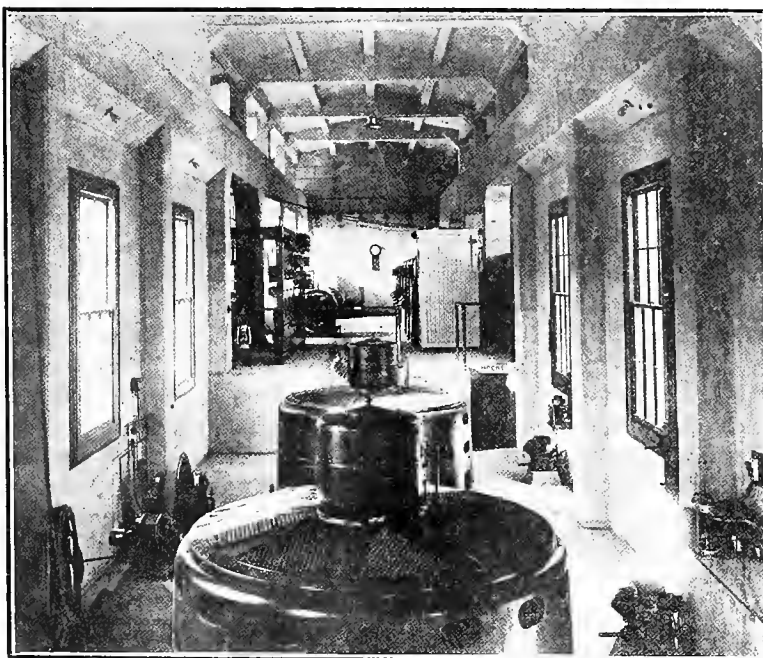
Records of the operation of pumping plants for irrigation are not generally kept in such form as to enable the unit costs to be determined. Many such pumping plants keep records of expenditures but few also keep records of the quantities of water pumped and the lifts. Unit costs for pumping are more conveniently expressed in terms of the cost of raising one acre foot of water through a height of one foot or per foot acre foot.

In the recently issued Fifteenth Annual Report of the U. S. Reclamation Service information regarding the costs and operation results with a number of plants for the year 1915-16 is given from which the following discussion has been prepared. The general data are assembled in Table 1.

On the Salt River project the pumps are operated by electric power generated by the power plants of the Reclamation Service. These pumping plants, except the High Line are used to augment the gravity supply from wells.

Each unit consists of a battery of 3 wells located in a straight line 30 ft. apart except battery A where the wells are 25 ft. apart. These units develop approximately 10 second feet each except Battery A which has developed but 8 second feet.

On the Minidoka project the first, second and third lifts are used on the south side pumping unit which supplies a total of about 50,000 acres. In 1914 the runners in the pumps were replaced and some slight changes made in the diffusion vanes at a cost of less than \$1500



Interior View of Minidoka Pumping Station No. 2



Forebay and Discharge, Pumping Station No. 1 of the Minidoka Project

per unit which increased the capacity approximately 30 per cent. The stations now have a capacity of 732, 617 and 433 second feet for each lift respectively. The power is generated at the diversion dam on the Snake River, the water which must be let pass for rights lower on the river being used under a head of 46 ft. The actual cost of operating and maintaining the power house and transmission lines exclusive of interest charges was less than \$3 per horsepower per year. This represents the cost of delivering a very large block of power at high voltage and should not be confused with the cost of delivering in retail quantities.

The remaining plants on the Minidoka project are used to irrigate areas too high for gravity service. The A4 plant is of the scoop wheel type.

The pumping plants on the Huntley and Yakima projects utilize the power secured from a fall in the canals to lift a portion of the water to higher levels. On the Huntley project a drop of 34 ft. in the main canal develops power to pump 56 second feet into a canal 46 ft. above the main canal. Each unit consists of a 20 in. centrifugal pump mounted on the same shaft with the vertical turbine which drives it. Operation is practically automatic. On the Yakima project the Snipes Mountain plant consists of one 12 in. 2-stage and one 8 in. single stage turbine centrifugal pump direct connected to turbines of 360 and 148 h.p. respectively. The drive head is 64 ft. and the delivery head 190 ft. The Hillcrest plant consists of one four-stage vertical direct connected turbine centrifugal pump unit. The drive head is 32 ft. and the delivery head 112 ft.

The two plants on the Yuma project are gas engine driven. The Reservation Drainage plant is used to discharge drainage water over the levee, its operation being intermittent. The Yuma Valley plant is a temporary installation assembled from used equipment on hand, a new unit being contemplated when the requirements of use have been more definitely determined. The high costs are due to the low lifts and nature of the service.

A number of the columns in the table have been derived from the data as given in the published report. In the operation of such power developments, the cost of operation and maintenance of the power house and transmission lines is distributed to the various users of the power developed. The cost of power for these plants is generally low as it is developed at sites made available by the irrigation development as on the Minidoka project. The form used for compiling the costs of the operation and maintenance of the pumping plants is shown in Fig. 1. (Use form 7-326 of Use Book of June, 1914). The costs given in the table

are the totals as shown by such reports for the year. These costs do not include interest on the investment.

From the total power consumption in kilowatt hours, the lift and the acre feet pumped as given in the report the seasonal average kilowatt hours used per foot acre foot can be computed. For 100 per cent efficiency, 1.025 kilowatt hours will be required per foot acre foot. These efficiencies are the over all result for the plant as a whole. The 73.2 per cent efficiency of the High Line plant of the Salt River project is noticeably high. The lowest efficiencies are for the small plants on the low lifts, a result to be expected.

The annual load factor is computed from the capacity of prime movers and the total power consumption. This gives a load factor based on connected load instead of maximum demand. As the Salt River plants, except the High Line pumps, are used as supplementary plants, the load factor is not as high as the long length of irrigation season makes usual for plants supplying the full seasonal requirements. The High Line plant represents a very favorable power load. The load factors on the larger plants on the Minidoka project also are quite high when the shorter irrigation season is taken into consideration.

The total costs of pumping plants in terms of both horsepower of prime movers and of second feet of capacity are computed for those plants for which the data is given. These show a wide variation as is to be expected. The plants pumping from wells on the Salt River project have cost about \$250 per horsepower or \$2000 per second foot of capacity. These costs include the cost of the wells. The large units on the Minidoka project show the much lower costs which are possible with plants of this character. The three plants will serve a total area of about 50,000 acres or a total cost for the pumping plants alone of about \$10 per acre. The costs of direct connected turbine and pump plants vary with the size but are lower than for well plants. The costs for the Yuma pump are not typical as they are temporary units assembled from available equipment.

The cost of operation varies widely due to the varying cost of power, efficiency of the plant and the load factor. The highest unit costs are for those plants operating on low factors or low lifts. The very low costs for plants operating at drops is very noticeable and emphasizes the relative economy of such developments. Water is lifted 197 ft. on the Snipes Mountain plant for about the same operation cost as it can be lifted from wells with about one-fourth the lift on the Salt River project, the difference being due to the

size of the plant and the conditions under which it works.

PUMPING STATION REPORT DEPARTMENT OF THE INTERIOR
UNITED STATES RECLAMATION SERVICE

7-22
(March, 1914)
Monthly O. & M. Cost Report

Project: _____

Pumping Station Report for
OPERATION DATA

Name of Plant _____
Capacity in sec.-ft. _____
Number of units in plant _____
Maximum number of units run at one time _____
Acre-foot pumped _____
Average lift in feet _____
Foot-acre-ft. pumped _____
Energy used in kw.-hr. _____
Maximum power demand in kw. _____
Kind of fuel used _____
Number of fuel units used in lb. or gal. _____
B. t. u. per fuel unit _____
Kw.-hr. per fuel unit _____
Cost per acre-ft. average lift _____

COSTS

Code and Account Number	CLASSIFICATION	TOTAL COST				UNIT COST PER FOOT-ACRE-FOOT
		Current Month	Same Month Last Year	Increase or Decrease	From December 1st of Preceding Year	
-180	OPERATION					
-191	Superintendence					
-192	Labor					
-193	Fuel (steam plants)					
-194	Power used					
-195	Supplies and miscellaneous					
-196	General expense					
	Total					
-197	MAINTENANCE					
-198	Pumping Machinery					
-199	Superintendence					
-200	Labor					
-201	M. & S. & Misc.					
-202	Equipment depreciation					
-203	Plant depreciation					
-204	General expense					
	Sub-Total					
-205	Buildings and Grounds					
-206	Superintendence					
-207	Labor					
-208	M. & S. & Misc.					
-209	Equipment depreciation					
-210	Plant depreciation					
-211	General expense					
	Sub-Total					
	Total					
	Total Operation & Maintenance					

*Decrease

Miniature of a Form Printed on Letter-size Sheets
for the Pumping Station Report

The figures given in the report do not include interest on the cost of construction. The cost of construction is given however so that the interest charges for any desired rate of interest can be computed to

give a basis of comparison with private developments. All other costs including depreciation are included. The costs given in Table 1 are based on interest at 6 per cent. The interest cost per kilowatt hour of power used, per acre foot pumped and per foot acre foot are given. For plants operating with low load factors the interest cost may exceed the cost of the power. In the last column the proportion of the total cost represented by the interest charge is given. The 6 per cent rate of interest is lower than that paid on the actual cost by many pumping plants due to the discount at which securities have been sold.

The total costs, including interest, show that water is being lifted by plants pumping from large wells as on the Salt River project for from 3 to 7 cents per foot acre foot when the power can be cheaply secured. For large plants pumping from canals such as the Minidoka lifts the cost may be as low as 1c per foot acre foot. These costs can only be obtained however where the power is secured under unusually favorable conditions. Pumping at drops is also relatively low in cost, interest charges being much more important than operation expenses. With high load factors such plants give very low total costs. With temporary plants, for low lifts or for irregular operation, the costs per unit accomplished may be several times the general figures just mentioned.

Idaho, Utah, Wyoming and Montana possess vast deposits of high-grade phosphate rock. Although the phosphate areas are by no means completely surveyed, the amount of phosphate in the known deposits, as estimated by the United States Geological Survey, Department of the Interior, is nearly five and one-half billion tons. An idea of the immensity of this tonnage may be obtained by comparing it with last year's production in the United States of 1,980,000 tons. Thus it is seen that electro-chemical industries in the West have a brilliant future before them.

Table 1.—Operation Records of Irrigation Pumping Plants of the U. S. Reclamation Service for 1915-16

Plant	Type of Plant	Capacity of Prime Movers—H.P.	Number of Units	Head Pumped Against—feet	First Cost of Plant	Energy Used for Pumping, kw.-hr.	Acre Feet Pumped	Kilowatt Hours Used per Foot Acre Foot	Seasonal Plant Efficiency, per cent	Annual Load Factor, per cent	Per h.p. of Prime Mover	Cost of Plant		Interest on First Cost of Plant at 6%				Total Cost per Foot Acre Foot	Interest Cost, per cent of Total	
												Per Second Foot of Capacity	Per Acre Foot Pumped	Per Acre Foot Per Foot	Per Acre Foot Pumped	Per kw.-hr. Used	Per Foot Acre Ft			
Salt River Project.																				
Battery	A	Vertical	75	1	49.0	\$16,425	57,300	632	1.85	55.5	11.7	\$219	\$2050	\$1.93	3.9c	\$1.57	1.7c	3.2c	7.1c	45
	B	Motor	75	1	46.2	20,604	139,128	1,775	1.70	60.2	28.3	275	2060	1.18	2.6c	.70	.9c	1.5c	4.1c	37
	C	Driven	75	1	48.4	16,735	141,891	1,843	1.59	64.5	28.8	223	1670	1.00	2.1c	.54	.7c	1.1c	3.2c	25
	D	Centrifugal	75	1	46.5	19,358	158,220	2,262	1.50	68.3	32.2	358	1940	.99	2.1c	.51	.7c	1.1c	3.2c	34
	E	ugal	75	1	44.5	21,848	146,453	1,978	1.65	62.1	29.8	290	2180	1.17	2.6c	.66	.9c	1.5c	4.1c	36
	F	Pumps	75	1	32.0	16,808	108,060	1,489	2.28	45.0	22.0	325	1680	1.19	3.7c	.68	.9c	2.1c	5.8c	36
McQueen Well...			75	1	40.0	17,254	60,601	675	2.25	45.6	12.3	230	1730	.88	2.2c	1.54	1.7c	3.8c	6.0c	64
Clemons	Horiz.	Motor	100	1	31.3	8,124	156,602	1,945	2.56	40.1	23.8	81	740	.97	3.1c	.25	3.1c	.8c	3.9c	20
San Francisco...	Driven Cent.		100	1	30.0	29,979	40,984	526	2.60	39.5	6.2	300	5000	3.54	11.8c	3.40	4.4c	11.3c	23.1c	49
High Line	Pumps		450	3	43.0	27,229	1,716,910	24,500	1.40	73.2	58.3	61	....	.55	1.3c	.07	.1c	.2c	1.5c	13
Minidoka Project.																				
First Lift...	Vert. Motor		2760	5	29.1	180,314	8,182,910	177,400	1.58	65.0	45.3	65	246	{	....	.06	.1c	.2c	1.0c	20
Second Lift...	Driven Cent.		2400	4	30.3	187,090	{	147,400	{	1.73	59.3	47.0	78	304	.24	.08	.1c	.2c	1.0c	20
							12,199,400									.07	.1	.2c	1.0c	20
Third Lift...	Pumps		1560	3	29.9	99,951	87,100	86	2.30	45.0	12.3	230	{	....	.07	.1c	.2c	1.0c	20	
West End.....	Horiz. Motor		150	2	20.8	18,372	342,076	6,820	2.42	42.4	34.8	122	920	.29	1.4c	.16	.3c	.8c	2.2c	36
1812 Station...	Driven Cent.		5	1	3.8	1,009	3,386	230	3.90	26.3	10.3	200	....	.41	11.0c	.26	1.8c	6.8c	17.8c	38
A 4 Station...	Scoop Wheel		25	1	2.9	3,202	19,726	1,997	3.39	30.3	12.0	128	....	.11	3.7c	.10	1.0c	3.4c	7.1c	48
Huntley Project.	Vert. Turb.																			
Balantine	Driven Cent.		596	2	46.3	71,522	....	6,508	....	....	....	120	1275	.05	.1c	.66	....	1.4c	1.5c	92
Yakima Project.																				
Snipes Mount	Vert. Turb.		500	2	197	....	....	2,005	....	....	....	....	....	1.15	.6c	1.26	....	.6c	1.2c	52
Hillcrest ...	Driv. Cent.		35	1	103	5,660	....	175	....	....	....	162	....	.35	.3c	1.94	....	1.9c	2.2c	85
Yuma.																				
Reservation																				
Drainage ...	Gas Engine		110	2	5 to 6	6,776	....	2,800	....	....	....	62	....	.58	10.6c	.14	....	2.6c	13.2c	20
Yuma Valley..	Driv. Cent.		40	2	4	900	....	758	....	....	....	22	....	.93	23.2c	.07	....	1.8c	25.0c	7

THE BONUS, WATER RIGHT VALUE, APPRECIATION

BY C. E. GRUNSKY

(The rate-base is dependent upon several variables that must be most carefully considered in any discussion of utility earnings. The bonus, the water right value, and appreciation are factors that need especial attention. These factors are dealt with in the following discussion and illustrations are drawn by the author who is a consulting engineer at San Francisco and a well-known writer and authority on the subject of rates.—The Editor.)

The question is sometimes asked, "How does a bonus affect the rate-base?" The answer to this question should be given with due regard to all circumstances. Thus for example, if the owner is given a bonus to build a steamboat equal to the entire cost of the steamboat and the earnings are such that within the life of the boat there will be a surplus, above operating cost plus compensation to the owner for management, such that this surplus will build a new steamboat, the owner will have at no time made any investment and it may be proper to use a rate-base without inclusion of the steamboat. If, however, the earnings have yielded only a moderate excess over operating expenses and no fund has been, nor could have been created out of surplus earnings from which to pay for the renewal of the steamboat, then the new steamboat will have to be constructed with funds borrowed or at any rate contributed by the owner. The original bonus will have disappeared as a business loss and the cost of the new steamer will be included in the rate-base. Or, as another illustration, in the interest of some local project as, for example, the development of a coal mine a line of railroad is built which is then turned over as a gift, subject to the condition that it be operated, to some larger railway system. The new owner of the railroad in this case has made no investment. The coal road may not pay. Perhaps its earnings will just offset operating expenses including a proper allowance for replacement (depreciation). The new owner has made no sacrifice to acquire the coal road. Its cost need not be included in the rate-base unless the addition of the road as a profit allowance is justified by circumstances. In most cases in practice the latter will be proper and ordinarily when long established systems and long past transactions are under review no other course would be followed. The situation is similar when a tract of land is laid out in town lots and the streets are improved and water and gas mains are laid and these mains are then donated to the established water and gas companies with no condition other than that water and gas be supplied to those who locate upon the tract. Here again the owners of the water and gas works enter into obligations to operate and maintain the additions to their systems; but they have made no sacrifice to secure these additions which in the end will be paid for by the purchasers of the lots in the subdivided area. Consequently these additions should not appear in the rate-base, at least not at full cost until the demand upon them is so large that their inclusion will not be a burden upon the rest of the system. Whenever included, unless they have been operated at a loss (receipts less than operating expenses), their inclusion will be equivalent to a profit allowance to their owners. Good practice would be to give preference to the inclusion of such donation except when they are of recent date or when other circumstances warrant a special investigation to determine the course of action.

That a water-right has value is now a generally recognized fact. When water is used for irrigation it assists in producing a crop which can be put on the market at prices not subject to regulation. The water delivered at the irrigated farm has a value determinable from the profit which it enables the farmer to make by increasing the crop output of his soil. The water in the stream from which the canal system obtains its water for delivery to the farmer, has greater or less value according to many modifying factors such as the character and value of the crop irrigated; the amount of water required to produce the crop; the cost of the canal system in relation to the acreage served; the quality of the water; the availability of alternative sources of supply; the limit of the supply in the available sources in comparison with the area of irrigable lands; the cost of preparing the land for irrigation; and the prospective demand upon the source of supply for higher uses of the water. The riparian right, too, has value not alone because the water is in the stream at the border of the land but also because under the doctrine of riparian rights the land owner has a limited right to use the water. Consequently when there is any new development involving the utilization of water the adjustment with the owners of prior rights may involve an outlay. In any well settled region, the cases will be rare in which water can be had without cost. Any legitimate expenditure for water-rights by the owner of a public utility is to be made a part of the rate-base. Whenever, therefore, the time has come when the use of the water is a necessity and there is no cheaper alternative source of supply a strategic value may result as in the case of rates which were determined by the less favorable situation of some other concern operating in the same territory. On this subject the following is taken from "Valuation, Depreciation and the Rate-Base," page 216:

"As an illustration of special water-right value the case of a water supply for general and domestic use which affords water of prime quality in limited amount may be taken, but which, when compared with other sources in use in the same community, has the advantage of proximity, elevation and reliability of service.

"Let it be assumed, for example, that such a supply was the first to come into use, that its water was distributed as required throughout the built-up section of a growing town, but that at length a time came when additional water had to be brought in by a second system from some remote source, and that at the time of the valuation the distributing pipes of each of the two systems cover practically the entire built-up territory. The original water-works may now be supplying only a small fraction of the aggregate amount of water being used. Undoubtedly under such circumstances, the charge for water by the two concerns would be the same or very nearly the same. The water from the newer works could not be supplied at a low enough rate to drive the earlier concern out of business. Without any reduction of rates, this original utility should hold its customers. There need be no falling off in the amount of water which it sup-

plies, assumed to be the limit of its capacity. But, if, as assumed, the rates charged by the two concerns are the same, the relative amount of net earnings will be greater for the original than for the new water-works. If it costs the original concern 17.5 cents per thousand gallons to develop and market its water crop (interest on the investment included) and it is costing the new concern 20 cents to do the same, and if this larger cost has been taken into account in fixing the water rates, then the water-right and other intangible elements of value of the original concern may reasonably be valued at (\$200-\$175) \$25, per day per million gallons of daily delivery more than the water-right and other intangible elements of value of the new concern. This is interest on about \$150,000, if 6 per cent per annum be made the basis of the calculation.

"If, in other words, rates are allowed which in the case of the new or main water-works system will create a water-right value of \$50,000 per million gallons of daily delivery for the new water-works, then the value of the water-rights controlled by the original system may be about \$200,000 per million gallons per day."

How to determine the value of a water-right is a question which has not yet been satisfactorily answered. There is no general market for water-rights. Their beneficial use is restricted to limited areas and to certain purposes such as the generation of power, irrigation and domestic use. It is not possible to go into the market at any time and to secure a bid for a water-right. Nevertheless there are cases in which a determination, at least of an upper or lower limit of value, can be made. The city of Sacramento, for example, draws its water direct from Sacramento River. The low water flow of the river at Sacramento is about 5000 cubic feet per second. The demand of the city upon the river in comparison with this volume is so small as to be almost negligible. The abstraction of the city water is no damage to navigation interests nor to the rights of riparian owners. The state has not exacted any payment for the privilege of taking the water. The water-right has only nominal value although the water is applied to the highest possible type of use.

In contrast with such a situation, there is the water power right controlled by riparian ownership in a region where the demand for power is such that the desirability of utilizing the water-power is unquestioned. The value of the power right in such circumstances is determinable from the market value of power as established by the use of oil or coal, as the case may be, provided always that the water-power is not of such magnitude as to completely crowd coal and oil out of the field. In the event that this happens the steam plant can do no more than determine an upper limit of the value of the water-power.

Conditions may be such that at current prices of fuel the cost of developing power is less with steam than with water in which event the wisdom of the water-power development may be called in question. But in view of the advantage to society of bringing all water-powers into use so as to conserve the consumption of the oil and coal, whose supply is limited, it should be assumed that the cases will be rare indeed in which the owner of the water-power plant should be denied all reward for having gone into the power business as he might be in case that no profit is allowed, the absence of which would eliminate all intangible values, including the water-right. When such

a case is presented liberal treatment may be expected and even demanded as a reward for the conservation of power that otherwise would be lost. The owner, even in such cases, is entitled to share in the benefit which he confers upon society.

Shall appreciation be allowed to the public utility and if so, how? Yes, but within limits. If instead of owning the properties whose value increases with age, such as real estate, these properties were leased from outside owners, the demand by such outside owners would be for rentals increasing with the increasing value. The increasing value may, therefore, be allowed, but if allowed it is a part of the aggregate profit which should go to the owner as already explained, to permit him to participate in the general prosperity of the community, which is reflected in the appreciation, and to compensate him for management and business hazards. As the appreciation of real-estate is not regular and cannot be forecast with any great degree of precision, and as the appreciation in certain cases in the past has been beyond any equitable allowance of profit, it is more logical after regulation of rates has commenced and a proper rate-base has been once established, to treat appreciating property as having been dedicated to public use at its cost or, in some cases, at the estimated cost of reproduction when the initial valuation for rate regulation purposes is made, always conditioned upon the payment by the public of a reasonable amount for such use, and thereafter to let the general profit allowance include something for current appreciation, thus covering the owner's share in the general prosperity and protecting the rate-payer's participation in the utility's unearned increment. Under this system even the utility which does not own real-estate or other appreciating property would also get a fair share of the unearned increment. It should be remembered, in this connection, that the value of money is constantly dropping. The rise in the value of real-estate is, therefore, not entirely due to the demand of society that it be used for higher purposes. This rise is in part due to the fact that as time goes on the same amount of money will purchase a smaller amount of service or of the necessities and conveniences that make life possible and worth while. It is the function of the profit allowance to meet this hazard among the others which would in part be covered by appreciation for the utility rich in real-estate, but to which other utilities which own no realty are also entitled. Herein will be seen good reason for adopting the writer's suggestion of bringing the profit allowance into a fair relation to the volume of business.

To illustrate some of the fundamental principles in their practical application, a railroad property may be brought under consideration which has been long in operation. By an examination of book records and a physical valuation it has been determined that the legitimate original cost of the railroad may be taken at \$20,000,000 and that ordinary operating expenses are \$2,000,000 and the average annual expenditures for replacements are \$500,000 per year. In making an appraisal of value in conformity with the requirements of the Interstate Commerce Commission, it is found that the accrued depreciation of physical properties is \$4,000,000. The appreciation in this case and the cost of developing the business are assumed to be in-

cluded, so far as allowable, in the \$20,000,000. The bonds of the road are 6 per cent and a fair allowance for discounts and commissions shows that 7 per cent would be a fair net rate of interest on borrowed money free from any profit increment.

Under the proceedings as they are customary the further inquiry would relate to the "going value" and to the proper rate of return on the fair value of the property. Suppose the going value is allowed at \$2,000,000 and that 8 per cent be agreed upon as a fair rate of return.

According to the usual custom the allowable earnings would be found as follows:

Cost new	\$20,000,000
Accrued depreciation	4,000,000
Cost new less depreciation	\$16,000,000
Going value	2,000,000
The present or fair value	\$18,000,000
Required Earnings—	
Operating expenses	\$ 2,000,000
Replacement allowance (depreciation)	500,000
Return allowance 8 per cent on \$18,000,000	1,440,000
Required earnings	\$ 3,940,000

Besides this there will be some more or less definite amount of appreciation which does not lend itself to inclusion in such figures as these

According to the alternative plan under which accrued depreciation is ignored, as of no effect upon the rates:

Rate-base, original investment = \$20,000,000.	
Required Earnings—	
Operating expenses	\$2,000,000
Replacement allowance	500,000
Interest 7 per cent on \$20,000,000	1,400,000
Profit allowance 10 per cent of the annual income about	400,000
	\$4,300,000

Either there must be considerable property in the possession of and in use by the railroad company of the type, which is increasing in value; or, under the first procedure, the allowed rate of return, 8 per cent, is too small; or, the allowance for going value is too small. If the last suggestion were the correct one and not supplemented by other factors, then "going value" should be increased to about \$7,000,000 instead of the \$2,000,000 introduced into the calculation. If the correction is to be made in the rate of return this would have to be allowed at about 10 per cent instead of at 8 per cent.

The advantage of bringing the profit allowance into a fair relation to the volume of business is best apparent in the case of a utility which does a large amount of business on a small investment. Suppose that an express company has invested \$1,000,000 and that its gross annual income for several years, has been about \$4,000,000. If the accrued depreciation is \$250,000 the ordinary procedure might be about as follows:

Present fair value of physical elements, etc.—	
Estimated cost new	\$1,000,000
Accrued depreciation	250,000
Cost new less depreciation	\$ 750,000
Going value possibly	2,000,000
Fair value	\$2,750,000
Required Earnings—	
Operating expenses	\$3,400,000
Replacement allowance	100,000
Return allowance 17½ on \$2,750,000	480,000
Total	\$3,980,000

It will be noted that the return rate is introduced into the calculation fairly high, because the invest-

ment is small and the courage is lacking to make the intangibles appear in the rate-base at \$5,000,000, or more, as they probably would be rated by a purchaser if the business is a monopoly.

Under the alternative plan the accrued depreciation would again be ignored and the profit allowance would, perhaps, be about 10 per cent on the volume of business:

Rate-base, the original investment = \$1,000,000.	
Required Earnings—	
Operating expenses	\$3,400,000
Replacement allowance	100,000
Interest 7 per cent on \$1,000,000	70,000
Profit allowance 10 per cent on \$4,000,000	400,000
Total	\$3,970,000

When all the capital is invested in a single depreciating item, as in the case of a steamboat, as already described, the first step of the usual practice is to find the steamboat's remaining value, a value which changes from year to year. Suppose that the steamboat has cost \$250,000; that it is found upon examination that it should serve about 5 years longer; that a steamboat of its type has a probable life when new of 20 years, and that the amount of business (gross income) has been about \$500,000 per annum.

In this case the remaining value of the steamboat would be determined by the sinking fund method and for a remaining life of 5 years in a 20-year life table at 7 per cent would be found to be \$97,000. Assuming the steamboat business to be a monopoly there would be something added for going value; perhaps as much as a new steamboat would cost or \$250,000.

The required earnings would be—	
Operating expenses	\$400,000
Replacement or depreciation allowance by the compound interest method; the amount which will retire the remaining value in 5 years, 7% interest	17,300
Return allowance 20% on (\$97,000 + \$250,000)	69,400
Total	\$486,700

While the question whether or not the earnings in the past have actually been sufficient to yield interest on the investment from the beginning plus the increment supposed to have been applied from year to year to retire capital will be a proper one, the large allowance of intangible value covers any possible past deficiency. This large allowance results from the consideration, it is assumed, of all the circumstances such as hazard, fluctuation in the annual volume of business and the like.

Under the simpler alternative procedure the original investment, \$250,000 would be the rate-base and the required earnings would be estimated as follows:

Required Earnings—	
Operating expenses	\$400,000
Replacement allowance sinking fund method 20 year life	6,100
Interest 7 per cent	17,500
Profit allowance about 12 per cent of \$500,000	60,000
Total	\$483,600

SOME OF THE PREVENTABLE WASTES IN AMERICA

According to S. W. Straus, in America we waste \$40,000,000 a year in the careless handling of eggs; we waste \$5,000,000,000 in soil erosion; \$238,000,000 in losses through floods and freshets. We are letting \$600,000,000 worth of energy go to waste; \$659,000,000 a year through losses in crops by insects which could be largely prevented by more careful methods of agriculture.

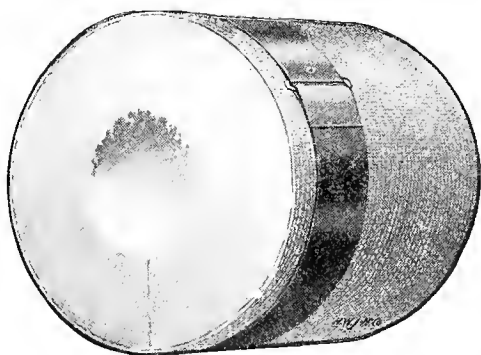
TYPES OF PRACTICAL HEAT INSULATION

BY JOHN CRAWFORD, JR.

(Practical heat insulation is a question of vital importance throughout the West, where electric heating is daily growing in importance as a profitable central station load. The mathematical analysis of heat flow in relation to costs involved in different types of heat insulating materials is of timely interest. Here is a paper by the manager of the asbestos and magnesio department of the H. W. Johns-Manville Company at San Francisco that should prove of great practical value in that these economic features are treated in a concise manner so that many points hitherto misunderstood are made clear.—The Editor.)

In designing heat insulation, man has done well to pattern his products after nature, for nature has provided her members of the animal and vegetable kingdom, where necessary, with most efficient forms of heat insulation known.

For example: The Eider duck, with not over an inch of feathers to insulate its body temperature of 98° F., can remain motionless in a temperature of 90° below zero for eight or nine hours at a stretch without freezing. But, see how nature has taken advantage of the laws of heat flow, in protecting it. The quill of each feather and each branching little barb is made of a material which is itself a very slow conductor of heat, and as each little feather is hollow, it encloses dead air, which is the slowest conductor of



Magnesia Pipe Covering

heat. The feathers lie one on top of the other so that between each two feathers there is an additional film of dead air. Thus, nature has provided against the loss of heat by conduction and convection and to reduce the loss by radiation, she has made the feathers white, smooth, and glossy on the surface.

The feathers of a bird find an analogy in the felted types of man-made heat insulation, such as asbesto-sponge felt and wool felt.

Next to the feathers of a bird, nature's best heat insulation is the fur of animals, especially the reindeer. Patterned after this is man-made hair felt. Next comes the bark of trees, which may be compared in design and insulating value to the well-known 85 per cent magnesia, diatomaceous earth and asbestos, and similar types of molded insulations.

Nature offers us no examples of the more inefficient forms of man-made insulation, such as "Air-Cell." Even the hollow bamboo stem is sealed off at intervals to reduce convection currents, and has an outer shell containing a large amount of dead air to retard conduction and a smooth, glistening surface to check radiation.

Commercial heat insulating materials may, for convenience, be divided into three groups, viz:

1. Those designed to insulate pipes.

2. Those designed to insulate large flat surfaces or large surfaces of little curvature.

3. Those designed to fill in the space between walls.

In the first group, we have pipe insulation which is furnished usually in sections three feet long to fit snugly the outer surface of standard pipes. *In the order of their efficiency in retarding the flow of heat, the best known of these are asbesto-sponge felt, hair felt, cork, 85 per cent magnesia, diatomaceous earth and asbestos, wool felt, plastic magnesia, cement, carocel and asbestocel, plastic asbestos cement, and air-cell.

In the second group, we have the same materials but furnished in blocks, 6 in. by 36 in., or in sheets, 24 in. by 36 in., or larger where the nature of the material permits.

In the third group, we have such substances as diatomaceous earth, granulated cork, dry magnesia and asbestos cements, mineral wool and loose asbestos.

Such of these materials as are of organic origin are not ordinarily used where temperatures much exceed 212° F. The temperature at which the other forms can be satisfactorily used is limited only by how greatly their retardance of heat flow diminishes as the temperature increases.

Mathematics of Heat Flow

(1) The rate of speed with which heat will flow from a warmer surface to a cooler one depends on the difference in temperature between these surfaces and on the nature of the medium through which the heat is traveling—i.e. its thermal conductivity.

(2) The total amount of heat which flows from a warmer surface to a cooler one in a given length of time depends—

(a) On the difference in temperature between the two surfaces.

(b) On the thermal conductivity of the medium through which the heat is traveling.

(c) On the thickness of the medium through which the heat is traveling.

(d) On the ratio of the area of the cool surface to the area of the warm one.

In the practical application of heat insulating materials, it is the maximum economical reduction of actual heat losses in which we are interested, not simply the rate of heat flow. Yet, in specifying the thickness of non-conducting materials to be used, this fact is frequently lost sight of.

Heat traveling from the warmer side to the cooler side of a flat plane, will flow in approximately parallel lines, but heat traveling into or out from a cylinder, a sphere, or a cube, travels in radiating lines to or from a theoretical central point.

* L. B. McMillan, Trans. A. S. M. E. No. 1514, Dec., 1915.
C. P. Randolph, Gen. Elec. Review, Feb., 1913.

Thus, in insulating pipes, tanks, boilers, retorts, furnaces, etc., against heat loss, it should be borne in mind that the most economical thickness of insulation to use, will vary with the relation of the area it is to proportion the thickness of insulation to the area of the inner surface which is the source of the heat flow.

Chart No. 1 shows graphically how very important it is to proportion the thickness of insulation to the internal volume of the source of heat flow. The limiting factor which determines the most economically efficient thickness of insulation is only reached when the value of the additional heat saved by increasing the thickness of the insulation does not show a yearly return commensurate with the additional investment.

This chart also illustrates that the loss of heat per unit of interior volume can be reduced more economically where the volumes are large than where they are small. This is because the amount of heat flow depends on the ratio of the inner surface which is the source of heat to the outer surface which is radiating the heat.

This ratio increases directly with the diameters of the inner and outer surfaces, but the interior volume increases very rapidly as the diameters increase. In the case of cubes and spheres, the interior volume increases as the cube of the diameter and in the case of cylinders, the interior volume increases as the square of the diameter.

It may be well to illustrate by a typical problem the economy of proportioning the thickness of insulation used, (all other things being equal) to the volume of the source of heat—

Mathematical Analysis

The amount of heat flow is usually expressed by the formula—

$$H = K (T' - T) \frac{A}{L} \quad \text{Where}$$

H = Amount of heat transferred per unit of time.

K = is a constant determined empirically, which indicates the rate of heat flow per unit of time for any particular material.

T' = Temperature of hotter surface.

T = Temperature of cooler surface.

A = Mean area of an outer surface S' and an inner surface S .

L = The distance between the surfaces S and S' .

Now if the heat is traveling through the walls of a long cylinder, such as pipe insulation, the mathematically correct formula becomes:

$$(5) H = K (T' - T) \times \frac{S' - S}{2.303 (\log S' - \log S) - L}$$

*Conversion factor Nap. to Com. logs.

If the heat is traveling through the walls of a sphere or a cube, the mathematically correct formula is:

$$(6) H = K (T' - T) \times \frac{\sqrt{S' - S}}{L}$$

However, for the most practical problems, a formula which uses the arithmetical mean of S' and S is sufficiently accurate, viz:

$$(7) H = \frac{K (T' - T)}{L} \times \frac{S' + S}{2}$$

It will be apparent that the factor K which denotes the rate of heat flow is the reciprocal of a factor which denotes the ability of any particular material to resist this heat flow.

$$\text{Hence, } K = \frac{1}{R}$$

It is often more convenient to use the reciprocal, especially when we have a series of materials of different conductivities and different thicknesses. Thus if r, r', r'' , represent the respective thermal resistances and L, L', L'' , the respective thicknesses of a series of heat insulating materials in contact, we may use the simple formula:

$$(8) H = \frac{T' - T}{rL + r'L' + r''L''} \times \frac{S' + S}{2}$$

Now let us compare the total amount of heat flow through one foot of one inch of asbesto-sponge felt insulation on a 1-inch pipe and on a 12-inch pipe, respectively—the pipes to contain steam at 150 lb. pressure and the temperature of the surrounding air to be 75° F.

$T' = 366^\circ \text{ F.}$ (the temp. corresponding to 150 lb. steam pressure).

$T = 75^\circ \text{ F.}$

K = for steel pipe 417 B.t.u. per sq. ft. per hour, per inch thickness, for each degree F. temperature difference between hotter and cooler surfaces. Hence its thermal resistance is only 0.0024 resistance units, which is so slight that the difference in temperature between the inside and outside of the pipe may be omitted.

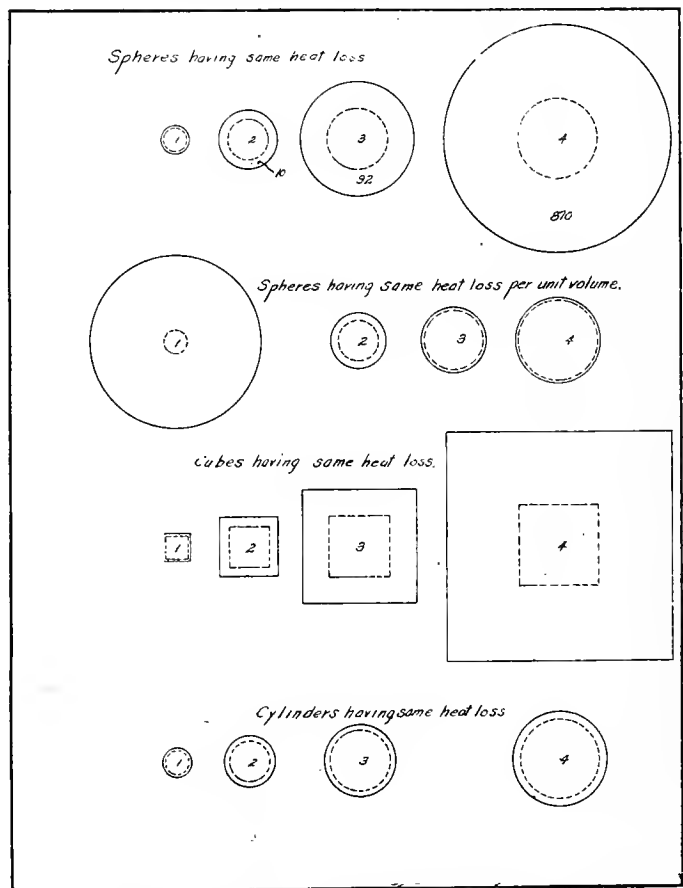


Chart 1. Comparative Drawings, showing Actual Loss and Same Relative Loss

K = for asbesto-sponge felt at approximately 300° F. temperature difference (C. P. Randolph, Gen. Elec. Review, Feb. 1913), is 0.33 B.t.u. per sq. ft. per hour, per inch thickness for each degree F. difference in temperature between the hot surface and surrounding air.

$$R = \frac{1}{0.33} = 3.03 \text{ resistance units.}$$

L = for asbesto-sponge felt is 1-inch.

$S' = 0.343$ sq. ft. for 1-inch pipe covering = 3.34 sq. ft. for 12-inch pipe covering.

$S = 0.866$ sq. ft. for 1-inch pipe covering = 3.86 sq. ft.

Substituting in formula (8) for 1-inch pipe, we have:

$$(9) \frac{366^\circ - 75^\circ}{3.03 \times 1\text{-inch}} \times \frac{0.343 + 0.866}{2} = 57.98 \text{ B.t.u. loss per hour from 1 ft. of 1-inch pipe insulated with 1-inch asbesto-sponge felt.}$$

For 12-inch pipe:

$$(10) \frac{366^\circ - 75^\circ}{3.03 \times 1\text{-inch}} \times \frac{3.34 + 3.86}{2} = 345.6 \text{ B.t.u. loss per hour from 1 ft. of 12-inch pipe insulated with 1-inch asbesto-sponge felt.}$$

It has been found empirically (L. B. McMillan Trans. A. S. M. E. Dec., 1915) that at 300° temperature difference between steam and air, steel pipe shows a drop of 2.3° F. for 1-inch thick, from inside surface of pipe to outside surface. As 1-inch pipe is only 0.13-inch thick, the temperature drop would be: $2.3^\circ \times 0.13 \text{ inch} = 0.299^\circ \text{ F.}$, between the inside and outside of pipe.

For 12-inch pipe the temperature drop would be:

$$2.3^\circ \times 0.37\text{-inch} = 0.851^\circ \text{ F. Hence,}$$

$$T' - T \text{ for 1-inch pipe} = 0.299^\circ,$$

$$\text{and } T' - T \text{ for 12-inch pipe} = 0.851^\circ.$$

$$S' \text{ for 1-inch pipe} = 0.274 \text{ sq. ft.; for 12-inch pipe } 3.14 \text{ sq. ft.}$$

$$S \text{ for 1-inch pipe} = 0.343 \text{ sq. ft.; for 12-inch pipe } 3.34 \text{ sq. ft.}$$

$$L \text{ for 1-inch pipe} = 0.13 \text{ inch for 12-inch pipe } 0.37 \text{ inch.}$$

$$R = \frac{1}{417} = 0.0024 \text{ resistance units.}$$

Now substituting in formula (8):

$$(11) \frac{0.299^\circ}{0.0024 \times 0.13 \text{ in.}} \times \frac{0.343 \text{ sq.ft.} + 0.274 \text{ sq. ft.}}{2}$$

$$= 295 \text{ B.t.u. lost per hour per foot of 1-inch pipe.}$$

$$(12) \frac{0.851^\circ}{0.0024 \times 0.37 \text{ in.}} \times \frac{3.14 \text{ sq. ft.} + 3.34 \text{ sq. ft.}}{2}$$

$$= 3105 \text{ B.t.u. lost per hour per foot of 12-inch pipe.}$$

$$\text{Loss through 1-inch bare pipe} = 295.00 \text{ B.t.u.}$$

$$\text{Loss through 1-inch insulation} = 57.98 \text{ "}$$

$$(13) \text{ Saving by insulation} = 237.02 \text{ " } = 81.0\% \text{ on 1 in. pipe.}$$

$$\text{Loss through 12-inch bare pipe} = 3105.2 \text{ "}$$

$$\text{Loss through 12-inch insulation} = 345.6 \text{ "}$$

$$(14) \text{ Saving by insulation} = 2759.6 \text{ " } = 88.8\% \text{ on 12 in. pipe.}$$

Thus it is apparent that the percentage of heat saving effected by insulation is greater on large pipes than on small ones.

The list price on 1-inch pipe insulation is 27c per lineal foot. Each lineal foot retards the flow of heat from 0.343 square feet of pipe surface. Hence, the insulation cost per square foot of outer radiating surface of 1-inch pipe is 78 4/5c for 1-inch thick insulation. The list price of 12-inch pipe insulation is \$1.85 per lineal foot and each lineal foot retards the flow of heat from 3.34 square feet of pipe surface. Hence, the insulation cost per square foot of outer radiating surface of 12-inch pipe is only 55 2/5c for 1-inch thick insulation.

The list price for 2-inch thick insulation, 12-inch pipe, is \$2.70 per lineal foot. Hence, the insulation cost per square foot of outer radiating surface for 2-inch thick insulation on 12-inch pipe is 80c per square foot or only 1 1/2c per square foot more than 1-inch thick insulation on 1-inch pipe.

For insulating surfaces 12 inches in diameter and larger where insulating blocks, (3 in. by 36 in. or 6 in. by 36 in.) can be used, this cost per square foot decreases still more—i.e. the price of 2-inch thick blocks is 60c per square foot and of 2 1/2-inch blocks 75c per square foot. Allowing 3 1/2c per square foot for the finishing cement and canvas, the cost per square foot of radiating surface for 2 1/2-inch thick insulation on 12-inch surfaces and larger is the same as the cost of 1-inch thick insulation on 1-inch pipe.

The actual heat loss in terms of fuel and les-

ened operating efficiency increases with the size of the radiating surfaces. The heat saving efficiency per square foot increases and the cost of insulation per square foot decreases with the circumference of the radiating surface. Hence, it does not seem to be a question of whether one can afford to use thicker insulation on large surfaces but whether one, in the interests of economical operation, can afford not to.

From statement (14) we note that the saving effected by insulating 1 lineal foot of 12-inch pipe with one inch of asbesto-sponge felt is 2759.6 B.t.u. per hour.

Taking fuel oil (which is the cheapest fuel we have) at 18,500 B.t.u. to the pound, this saving is equivalent to a saving of 0.149 lb. of oil.

It has been determined empirically (L. B. McMillan) that at 300° temperature difference 2-inch thick asbesto-sponge felt insulation will show an increase in heat saving of a little more than 40 per cent over 1-inch thick. Hence, if 2-inch thick insulation had been used the heat saving would be equivalent to 0.248 lb. of oil per lineal foot per hour.

The list price of 2-inch thick asbesto-sponge felt sectional insulation for 12-inch pipe is \$2.70 per lineal foot and for 1-inch thick, \$1.85. The increased cost of using 2-inch thick insulation over 1-inch thick is therefore 85c per lineal foot. The increased fuel saving is 0.099 lb. of oil per foot per hour.

Assuming oil to be worth \$1.25 per bbl. of 336 lb., or \$0.0038 per lb., the increased fuel saving per hour is \$0.000376 per lineal foot. Hence, to pay for the difference in cost between 2-inch thick and 1-inch thick insulation, it will take

$$\frac{\$0.85}{\$0.000376} = 2261 \text{ hours} = 3.1 \text{ months.}$$

Since the additional investment is amortized in three months by the increased saving, the economy of using the thicker insulation is self-evident.

NEW LAW FOR ELEVATOR INSPECTION

The bill which passed the last legislature, providing for inspection of Elevators, became effective July 27, 1917. It is known as Chapter 74, Laws of 1917, and stipulates that no power elevator or hand-power elevator shall be operated unless a permit to operate shall have been issued by the Industrial Accident Commission of the State of California, following an inspection either by a state inspector or an inspector holding a certificate of competency from the commission.

It is made a misdemeanor to operate elevators without the permit, and each day of operation without such permit will constitute a separate offense.

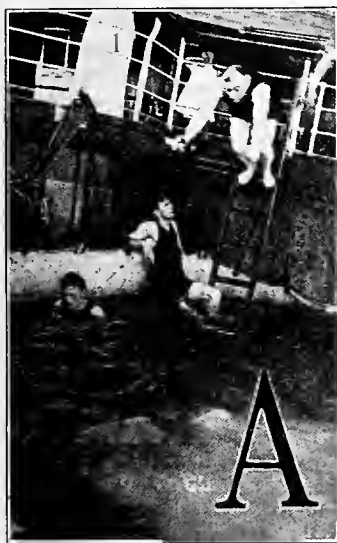
The Industrial Accident Commission has sent out return post cards to all owners or operators of elevators, asking that request be made on the post cards for an inspection of the elevator or elevators concerned.

Provision is made in the law that no penalty shall be attached where an elevator is operating without a permit if application for an inspection shall have been made, but remains unacted upon. This means has been adopted by the Industrial Accident Commission in order that owners of elevators will not be liable pending the required inspection.

SHORT JOURNEYS IN PACIFIC LANDS

(The water spout is a phenomenon unknown to the American citizen, who has not traveled in the tropics. Here is a description of an experience of an American engineer off the Island of Formosa near the coast of China, which will be interesting to any engineer contemplating a visit to the tropics. Other short notations from Japan and Chile will be found which will also prove helpful in forwarding educative knowledge concerning our Pacific neighbors.—The Editor.)

A WATER SPOUT



The Swimming Tank Proved Popular Aboard Ship

NOTHER phenomenon of the tropics which is interesting and at times a knowledge of which is of much importance to the engineer is the water spout.

Many of us have read of the wonders of a water spout; few, however, have beheld the actual beauty and grandeur of a perfectly formed phenomenon of this nature. When steaming between the domain of the Japanese Empire and the Philippine Islands, the morning of the second day found us some fifteen to twenty miles to the east of the

great island of Formosa, formerly a Chinese possession, but since the Chinese-Japanese war a possession of the latter power.

The day opened up in gorgeous magnificence. The rugged mountainous contour of the island which is some three hundred miles in length was studded with white clouds and led one to imagine many a chilling tragedy as being enacted in the wild canyon chasms of these mountains to our starboard side, where wild men, still unsubdued, roam at large. Towards noon, the atmosphere became quite sultry and thunder clouds resting at a height of some 1500 to 2000 feet entirely obscured the former silhouetted outline of the island. Suddenly a cry from one of the passengers called the attention of all on board to a long, narrow, vertical, cylindrical shaped spray of cloud which opened out in funnel shape at the top and bottom some six miles to the starboard side. The captain quickly identified this phenomenon as one of the clearest drawn water spouts he had seen in ten years. The water spout continued in unbroken alignment for over an hour when it gradually seemed to fade away in mist.

The water spout is said to be formed in a manner similar to the whirlwind on land. Two rapidly but oppositely moving bodies of air coming into direct contact causes an intense rotary motion to take place which, due to centrifugal action of the moving air, creates a vacuum in its center. The pressure of the air upon the water surface being thus reduced causes the evaporation of huge quantities of water. This water vapor immediately surges upwards and deposits itself as fine spray in the clouds above.

It is said that the water spout is usually followed by rain. Whether this be true or not, in our case a hot sultry, humid afternoon prevailed to such an extent that life seemed unbearable in the cabins below; hence, practically all the cabin passengers decided to sleep on deck. The swimming tank was in constant service until about ten-thirty in the evening. About midnight a terrific gale began to blow. The captain immediately came down from the bridge and announced rain ahead. The midnight parade of cots, pillows, and nightshirts which ensued at once, all heading toward the hatchway below offered in its humorous aspects much solace for the suffering from the stifling, sultry atmosphere and the loss of a night's rest. Needless to say, too, that the water spout and its resultant down-pour of rain will long be remembered by those aboard.

OPPORTUNITIES IN CHILE

Jorge Villegas, a well-known mechanical and electrical engineer, of Santiago, Chile, thus writes to one of his American correspondents:

The opportunities in Chile are enormous, and as soon as the crisis due to the war will be over, there is no doubt that American concerns will flock over here to get their supplies of raw material for American industries.

Iron, copper, coal, manganese, etc., are plentiful in this country, and have been hardly scratched. Many American engineers are of the opinion that, in about ten years from date, Chile will control the world's copper market. And this is the opinion of almost every one of the engineers that have been sent by Guggenheim, the Bethlehem Steel, and a few like corporations. The Bethlehem is tearing down a solid mountain of pure iron ore, something like 50,000 tons a day, I understand. In fact, the country is only waiting for capital and engineers to do the work.

ELECTRICAL ACTIVITY IN JAPAN

According to the latest investigations made by the authorities (December, 1916), the number of electrical enterprises in Japan, is estimated at about 642, having a total capital of 660,000,000 yen (a yen is about 50 cents in United States gold), and utilizing about 900,000 kilowatts per annum. Add to this the electricity generated in private plants, and the total figure amounts to about 1,150,000 kilowatts per annum. Compared with the figures of ten years ago, this shows an increase of about 260 per cent in number of enterprises; 400 per cent in amount of capital, and 380 per cent in kilowatts consumed. This rapid progress is due chiefly to the increased use of waterpower, which now supplies about 80 per cent of the electricity used.

ENGINEERING
COMMERCIAL

PROBLEMS AND SOLUTIONS

PUBLIC POLICY
ACCOUNTING

(Herein will be regularly found the questions that have been asked and the answers which have been given by members of the Pacific Coast Section of the National Electric Light Association. The purpose is to give terse replies to queries concerning electrical conditions peculiar to the Pacific Coast. All readers are invited to avail themselves of this new feature of Journal service by submitting questions or answers. Its value depends solely upon the use of it. Additional problems are solicited. All communication should be addressed to A. H. Halloran, Secretary Pacific Coast Section National Electric Light Association, 618 Mission Street, San Francisco.)

Public Policy

P. I. What are the purposes and provisions of the Walsh hydroelectric bill recently introduced in Congress?

John A. Britton, vice-president and general manager Pacific Gas & Electric Co., San Francisco: The recent introduction by Senator Thomas J. Walsh of Montana of a bill in Congress amending present acts relating to occupancy of government lands for hydroelectric development and prescribing methods by which present and past occupancy may be regulated achieves a new and very promising era in the much contended differences heretofore existing between hydroelectric companies and the government of the United States.

Under existing laws and the rules and regulations promulgated by the Departments of the Interior and Agriculture, there has been no disposition on the part of capital to embark on the rather uncertain proposition of developments hydroelectrically. The tendency of the rules and regulations heretofore promulgated and enforced has been to deter development and for the principal reason that the tenure of occupancy on government lands was uncertain.

Another vital objection to the regulations at present enforced is that an occupancy of government land, even though a minimum amount as compared with total development, places the entire development and everything connected therewith under governmental regulation. Also the tax imposed by the government, both in the construction period and the operating period, has been burdensome, considering the amount and value of land occupied.

The question of tenure is a most important one and the indefinite conditions of occupancy, subject to the will of the government, presented the greatest difficulty.

The Walsh bill, as framed, does away with the objections as to present conditions and, while not as liberal as it should be, taking into consideration the great benefits which will be derived by the utilization of the waters of any state for power purposes, yet is a big step in advance.

Briefly, the conditions are:

1st. Permissive occupancy of government lands for a fixed term of fifty years, and thereafter until government elects to take it over, or to lease it to another permittee, the original permittee having right of leasing as against any other person, if government decides to lease.

2d. Permitting all existing permits to be cancelled and new ones taken out under provisions of new law.

3d. That the United States will pay for the prop-

erty if it takes it over. "Just compensation therefor in the amount which, were proceedings instituted for the purpose of fixing rates, should be found therein to be the investment of the permittee upon which he is entitled to a fair return."

4th. The bill also protects contracts made in good faith and approved by the public service commissions in each state.

5th. The charges according to the provisions of the Act are proportioned in relation to the amount of land occupied by water conduits, flooded areas, and structures to the entire land occupied by the development.

6th. The bill provides that where only 10 per cent or less of the lands is actually necessary and required for the development and "such government lands are to be used only for overflowage, reservoir, transmission, or conduit purposes and not in whole or in part as a dam site or the site of a power house nor for the erection of buildings or operation of machinery, the Secretary of the Interior may, in his discretion, upon application by the applicant waive such conditions, provisions and requirements of this Act as he may deem just."

The bill further provides that in case not more than 5 per cent of such lands are government lands, the Secretary of the Interior shall waive all of the conditions, etc., of the Act, excepting the permittee shall be required to pay the fair value of the use of such lands, and if the permittee and Secretary of the Interior cannot agree, then a value shall be determined by proceedings in the United States District Court.

Under such liberal provisions as the above there is no question but what rapid development of latent power possibilities will ensue.

In California, particularly, the ascending price of oil necessitates immediate development of hydroelectric properties and conservation could not be practiced in any more practical and energetic way than by such development, as for example—if approximately 200,000 h.p. of hydroelectric power could be further developed to displace oil there would be saved annually in the State of California approximately 6,000,000 barrels of oil, and I am assuming that 200,000 h.p. would reasonably represent the amount that could at present be saved were more hydroelectric power available.

It is to be sincerely hoped that congress at the present time will view the situation in California as in need of special legislation, as no other state is in the peculiar position of this state in its requirement of either oil or hydroelectric power for its farming, industrial and domestic purposes, and California has

no substitute for either oil or hydroelectric power as other states have in the possession of their coal fields, and to conserve the oil for purposes for which hydroelectric power cannot be used there can be no better argument than such liberal conditions and privileges of occupancy of government lands to develop water power as will make the conservation so devoutly wished.

Engineering

E. 1. Can fuses of 5 ampere capacity or less, be depended upon to blow within fifty per cent of their rated load on 2300 volt circuits? Are they mechanically satisfactory? If so, what make of fuse is employed?

D. J. Butts, Western Electric Company, Los Angeles.—Fuses afford a satisfactory means for protecting 2000 to 15,000 volt distribution secondaries. The Western Electric Company markets a fuse operating in oil, the fuse link being a 1 in. aluminum strip supported by spring fingers. When the fuse blows the fingers open out so that there is a 4 in. space between points. These fuses operate within 12 per cent of their rating and open rapidly under short circuit conditions without injury to the renewable link. The renewal cost is about 12c.

C. 1. What are the electrical load characteristics of a wood pulp paper mill operating on the Pacific Coast?

J. W. Hungate, Spokane & Inland Empire Railroad, Spokane, Wash.—We furnish power to the Inland Empire Paper Company at Millwood, Wash., under a contract calling for the delivery of 2500 h.p. of primary power throughout the year and of 3500 h.p. of secondary power at such times as ample water is available. The primary power is used in the regular operation of the plant and the secondary power for cutting the logs into chips, which are stored for use throughout the year. The following gives requisite information:

The plant has an installed capacity of 5780 h.p. and has a monthly measured maximum demand and kilowatt hour consumption during the first 12 months as follows:

1916	Max. Demand	kw.-hr. Consumed	
June	3980 kw.	2,229,600	kw.-hrs.
July	4160 "	2,465,400	" "
August	2670 "	1,472,600	" "
September	2430 "	1,451,600	" "
October	2210 "	1,316,600	" "
November	2520 "	1,455,200	" "
December	2720 "	1,580,200	" "
1917			
January	3300 "	1,978,400	" "
February	3460 "	1,973,200	" "
March	3720 "	2,152,000	" "
April	3910 "	2,260,800	" "
May	3600 "	2,069,000	" "

The monthly measured maximum demand is taken during a five minute period. Service is delivered at 60,000 volts and measured at 440 volts. The rate is \$20 per h.p. per year for primary power and \$10 per h.p. per year for secondary, with no discounts and no variation depending upon monthly or yearly output on sales.

E. 2. What are the advantages of grounding the secondaries of small transformers on a residence distribution system?

C. E. Young, Pacific Gas & Electric Co., San

Francisco: (1) The company or customer will be able to detect accidental grounds on the service.

(2) The service is better protected from lightning, particularly when the transformers are affected.

(3) The service is protected should there be a break down between the primary and secondary of the transformer.

Awaiting Solution

A. 1. What methods have been employed with success in collecting over-due accounts?

E. 3. What is the impedance, reactance ohmic resistance and effective resistance of iron wire used to replace copper circuits for 2200 volt distribution work?

P. 2. In what spirit should public utilities meet municipal overtures to take over local distribution lines?

C. 2. Should a central station operating in towns of 5000 population or less encourage the entrance of independent electrical dealers? What assistance might be extended them?

E. 4. What pole height and spacing is advisable in building iron wire distribution lines?

C. 3. What effect is anticipated on current consumption for electric cooking and water heating if the high prices and security of oil and coal continue?

P. 3. Do the high costs of electrical equipment and increase in wages justify public service commission's raising rates for electric service? Would not such rate advances decrease current consumption to such a point as to make further raises necessary?

BRITISH COMMITTEE REPORT ON FATIGUE

As regards men engaged in heavy labor, data are not very complete, but as regards boys of 14 to 17, a reduction in the hours of labor from 73.3 to 57 produced an increase of output to the astonishing extent of one-third to one-half which indicates that the boys must have been overworked by long hours and that a reduction of 8 to 12 hours materially accelerated their rate of production.

On the whole, the committee comes to the conclusion that the hours of labor should be varied between wide limits according to the character of the work performed, and not maintained uniform for all types of labor and for workers of both sexes; and that where long hours of labor on the part of munition workers are necessary, an effort should be made to have them shut up in the factories for as short a time as possible.

In this connection attention is called to the importance of greater promptness in starting work. There can be no necessity for the waste of 25 min. in starting and stopping work, as was the case in a shop under investigation.

The custom in many munitions works is to work for a spell of 5 hours and then after an hour's interval for another spell of 4½ to 5 hours, which leads to spells which are undoubtedly too long in many types of munition work. A better plan would be to arrange for regular rest pauses in between. For instance, a 10 min. break in the middle of the morning and afternoon spells during which the operatives remain at their machines to take tea or other nutriment.

RECENT ADVANCES IN WESTERN WATER LAW

BY A. E. CHANDLER

(The proper procedure in the appropriating of water is a matter of great importance throughout the West, where the validity of a power development may at times be brought into question, due to the fact that the original filing was made in an improper manner. In this article the author, who is a well-known authority on water right law and a member of the California Water Commission, sets forth recent cases that relate to the appropriation of water and steps down their meaning in clear concise words for the information of the engineer.—The Editor.)

RECENT CASES RELATING TO THE APPROPRIATION OF WATER

Grant Realty Co. v. Ham, Yearsley & Ryrie,
Wash., 165 Pac. 495

Diligence in Construction Work.—The statutory method for the appropriation of water in Washington (prior to the adoption of the water code by the 1917 legislature) was similar to the method provided in California and other western states requiring posting and recording notice and prosecution of construction work with reasonable diligence to completion and diversion of water. In the Grant Realty Company case it was contended by the company that Ham and his associates had not prosecuted construction work with reasonable diligence after the posting of notice of water appropriation. The point in issue was the delay necessitated by condemnation of the lands necessary for construction purposes at Moses Lake, the waters of which had been appropriated. The company contended that the delay caused by litigation offered no excuse for failure to prosecute work diligently. The supreme court held, however, that "condemnation for a site for an impounding dam or intake by an appropriator who does not own such a site is just as much matter incident to the enterprise to which the dam or intake is an essential as is the actual construction of the dam or intake. It would be simply idle to confer, as our statute does confer, upon the owner of non-riparian lands the right to condemn for such purpose if the time necessarily consumed in the condemnation must be entered in red on the ledger of diligence, and thus defeat his right of priority by relation, which the statute as a whole was intended to give. If time necessarily consumed in condemnation must be charged as time lost through lack of diligence under the statute, then every enterprise in which the condemnation of a site for diversion works is necessary is a defeated enterprise at its inception and the statutory right to condemn is not a right but a snare. * * * The condemnation suit itself must be prosecuted with reasonable diligence and the court held in the present case that the suit had been so prosecuted.

It is also claimed that Ham had failed to exercise reasonable diligence because no work had been prosecuted on that part of the project not including the dam site which was being condemned. In dismissing this contention the court said "The dam and outlet works will cost about \$65,000; the ditches, flumes, and pipe lines about \$595,000. The interest on that sum since the commencement of the condemnation suit, October 7, 1910, at 4 per cent to this time, would amount to nearly \$150,000. This all to no purpose, since the line must have lain idle till the dam site could be secured, and the ditches, flumes, and

wooden pipes without water would have probably so deteriorated as to require a practical reconstruction when the dam site shall be secured. The law of diligence is not a rule of unreason and waste."

Alaska Juneau Gold Mining Co. v. Ebner Gold Mining Co., 239
Federal 638

Necessity of Access to Stream in Appropriating

Water—Measure of a Right by Appropriation.—Alaska has no statutes governing the appropriation of water. The right to appropriate is governed by the rules of the local mining districts. As elsewhere in the west, the practice has been followed by posting and recording notices of water appropriation. In the Alaska-Juneau case the Alaska Company attempted to show rights by appropriation superior to those of the Ebner Mining Company. The Alaska Company posted its notice of appropriation upon a mining claim which later became the property of the Ebner Company. The Federal Circuit Court of Appeals held that as the act was without the consent of the owner of the property it was an act of trespass and could not become the basis of a right to appropriate. The court quoted in full the following from the Cyclopaedia of Law and Procedure. "The right of appropriation extends only to waters upon the public domain of the United States, or upon the public lands of a state, for one cannot acquire a water right on land held in private ownership by another without acquiring an easement in such land." 40 Cyc. 704.

The above quotation does not mean that an appropriation cannot be made upon private lands, but

SYNOPSIS

Recent cases emphasize necessity for securing right of access to stream in appropriating water and also that courts use standards which are reasonable in passing upon "due diligence" in construction work under water appropriations.

The exact quantity of water which a riparian proprietor is entitled to use for irrigation, cannot ordinarily be ascertained in advance, for the reason that the right of each must be exercised in subordination to that of all the others.

simply means that the right of access to the stream must be obtained from the lawful owner before the appropriation can be considered valid. In this connection it is well to refer to the very definite statement in *Duckworth v. Watsonville; etc., Co.*, 150 Cal. 520, in which it is said: "The right to appropriate water under the provisions of the Civil Code is not confined to streams running over public lands of the United States. It exists wherever the appropriator can find water of a stream which has not been appropriated and in which no other person has or claims superior rights and interests."

It was claimed by the Alaska Company that the Ebner Company had not prosecuted its work with reasonable diligence, but the court held that although there was evidence of a temporary suspension of activity such activity was due to a "series of hostile acts" on the part of the Alaska Company and therefore excusable.

In its findings of fact the lower court had fixed the capacity of the diversion flume of the Ebner Mining Company at 3200 inches, but in its decree it awarded said company 10,000 inches—the amount stated in the notice of water appropriation posted in behalf of said company. In remanding the cause to the court below the Circuit Court of Appeals ordered that the decree should be changed to conform to the capacity of the flume. This order is in accordance with the well accepted principle that the first measure of an appropriator's right is the amount stated in his notice, but that his right upon the completion of his diversion works is limited to the capacity of such works.

Basinger v. Taylor, Idaho, 164 Pac. 522

Preference Water Rights—Water Right Permits.—Section 3 of article 15 of the constitution of Idaho provides that those using water for domestic purposes shall have the preference over those claiming for any other purpose in times of insufficiency of water supply. In the *Basinger* case the trial court, relying upon the above provision, decreed that a prior right for irrigation purposes should be subject to diversion "for domestic uses and culinary purposes" on the part of a subsequent appropriator. The supreme court, however, held that the usage for such superior purposes is subject to the provision of section 14 of article 1 of the constitution regulating the taking of private property for private use. As the action was one to quiet title and not a proceeding to condemn, the supreme court held the decree of the trial court to be erroneous in this respect. The constitutional provision regarding preference uses seems, therefore, to apply to the right of condemnation only.

Idaho, in 1903, adopted legislation providing for applications to the state engineer by those wishing to appropriate water. On the approval of an application a "permit" is issued which fixes the amount of water to be appropriated, the time within which construction work must be started, the time for completion of construction work and the time for complete application of the water appropriated to beneficial use. After a showing that the water has been completely applied to beneficial use in accordance with the permit a license is issued. In the *Basinger* case it was held that a per-

mit from the state engineer is not a water right but that it "merely expresses the consent of the state that the holder may acquire a water right, and if the holder of the permit substantially complies with all the requirements of the statute, to and including the actual application of the water to the beneficial use specified in the application for the permit, he may become the owner of a water right. * * *" The license, however, is held to be "prima facie evidence of a water right."

In re Sucker Creek, Oregon, 163 Pac. 430

Appropriation and Riparian Rights—Distinction in Oregon.—Under the procedure adopted in Oregon in 1909 for the determination of water rights, the state water board (composed of the state engineer and two division superintendents) up to March 1, 1917, had determined the water rights of 3664 claimants. Although a few of the number claimed riparian rights only one claimant was finally decreed a riparian right. In the *Sucker Creek* determination 45 claimants were before the board and all were satisfied with the resulting adjudication with the exception of one, Mary Ellen Leonard. On appeal Mrs. Leonard claimed riparian rights, but the supreme court held that as her claims before the water board were based upon prior appropriation it was too late to assert a claim of riparian rights. In the words of the court: "Repeated decisions have wedded this court to the doctrine that a settler upon a non-navigable stream has an election either to rely upon his rights as riparian proprietor, or to make an appropriation of the water, if it is subject to appropriation, and claim as an appropriator, but he cannot do both." This doctrine is, unfortunately, not followed in California.

In commenting on the measure of a right by prior appropriation and one by riparian ownership the court said: "The right of prior appropriation can be measured by a fixed rule, and the amount of water can be definitely determined, but the exact quantity of water which a riparian proprietor is entitled to use for irrigation cannot ordinarily be ascertained in advance, for the reason that the right of each must be exercised in subordination to that of all the others."

LARGEST MOTORSHIP THROUGH THE CANAL.

The motorship *George Washington* of the Norway-Pacific Line (Fred Olsen, operator), which passed through the Canal on December 22, is under charter to the government to carry coal from Norfolk to Tiburon. On her first trip in this service the ship carried 9121 tons of coal. She is 445 ft. in length by 55 ft. beam and was drawing 26 ft. 9 inches at time of transit. This is the largest motorship which has passed through the Canal. The *Chile*, which made the transit on July 31, 1916, has a length of 445 ft. and beam of 53 ft.; her canal tonnage is slightly less than the *George Washington's*.

The largest cargo which has been carried through by a motorship was 9200 tons, that of the *Falstria*, which made the transit on June 30, 1916.

SUGGESTIONS FOR CONTRACTOR AND DEALER

DEPARTMENT CONDUCTED BY GEORGE A SCHNEIDER

(On account of the enormous number of storage cells now being installed for isolated lighting plants, signaling purposes and the like this article on protective devices for storage battery charging plants is particularly opportune at this time. It is written especially for the electrical dealer or contractor but should be of interest to industrial plants, electricians or others who are called upon to select devices of this kind. The information will undoubtedly prove useful for those having in charge the electrification of army cantonments. The author is power apparatus specialist for a well-known electrical supply house in San Francisco.—The Editor.)

PROTECTIVE DEVICES FOR STORAGE BATTERY CHARGING CIRCUITS

Protective devices for this service may be classified as follows:

- (a) Plain underload, or combined underload and overload circuit breakers, having series winding only.
- (b) Automatic cut-outs having both series and potential windings.
- (c) Low-voltage and reverse current circuit breakers, having both series and potential windings.
- (d) Automatic cut-out having alternating current potential winding only.

This is not a complete classification of all the types that are possible, but covers practically all of the devices that are used in connection with small storage battery lighting plants or generator sets for battery charging service.

The plain underload breaker was illustrated and described in the last issue of the Journal of Electricity. As was pointed out, the disadvantage of this type for certain classes of work is that it must be manually closed after having opened either due to underload or complete failure of the charging circuit.

An automatic cut-out switch of the type covered by paragraph (b) in the classification given is illustrated in Fig. 1. The function of this switch is to

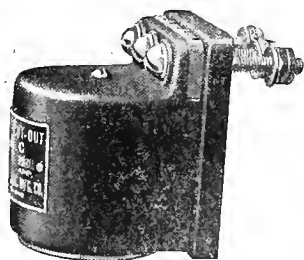


Fig. 1. Automatic Cut-out for Constant Voltage Service

automatically connect the charging circuit with the battery circuit whenever the voltage of the charging circuit is high enough to charge the batteries and to automatically break or "cut out" the charging circuit when the voltage is too low—that is when there is a reverse current from the battery to the charging circuit.

This cut-out switch consists of a disc shaped contact plate attached to a movable core, a set of stationary contacts and the necessary solenoid windings completely enclosed in a suitable casing. The internal connections are shown in Fig. 2. There are two windings—a shunt or potential winding connected directly across the generator terminals and a series or current winding connected in series with the battery circuit or load.

When the voltage of the generator is equal to the voltage for which the cut-out has been adjusted to operate, the current flowing through the potential winding will cause the solenoid core to rise and thus close the switch contacts. It will do this whether or

not the battery circuit is connected. If the battery circuit is completed by the closing of the cut-out contacts, the series winding at once comes into action, assisting the potential winding in holding the contacts closed.

The pull exerted by the series winding is proportional to the charging current and therefore tends to hold the contacts more firmly closed as the current increases. This is a desirable feature as it prevents overheating or burning due to poor contact between the switch contacts.

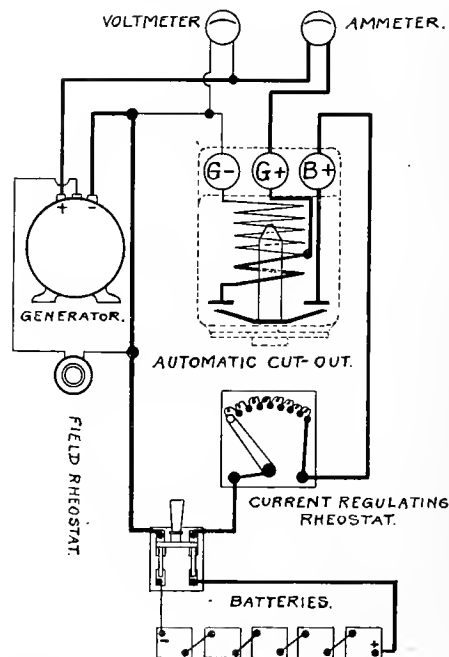


Fig. 2. Diagram showing Method of Charging Batteries with Constant Generator Voltage

Should the power driving the generator fail or the voltage of the generator fall below a certain value, current from the battery will flow through the series winding of the cut-out in a reverse direction into the generator, thereby neutralizing the effect of the potential winding and allowing the switch to open by gravity but the switch will again automatically close when the conditions are restored to normal. Only a small reverse current is required to open the switch so the contacts are always broken under practically no load conditions. This type of cut-out will give complete protection against reverse current and low voltage.

In selecting switches of this design for isolated lighting plants it is necessary to know the ampere capacity required, the number of cells to be charged

in series and whether the cells are of the lead plate or Edison type. The number of cells and their kind will determine the voltage for which the potential coil must be wound and the cut-in voltage for the switch. The cut-in voltage adopted by one of the leading manufacturers of these devices is as follows:

- 32 volt system, 16 lead cells in series, 38-40 volts.
- 65 volt system, 32 lead cells in series, 78-80 volts.
- 110 volt system, 56 lead cells in series, 138-140 volts.
- 110 volt system, 56 lead cells charged in two parallel groups of 28 cells each and discharged in series, 106-108 volts.

In battery charging service stations the number of cells on charge will vary and the type of cut-out will depend on whether or not the generator is operated at practically constant voltage or at a voltage varying with the number of cells. The particular cut-out so far described is suitable only for those installations employing constant generator voltage. This method of charging is outlined in Fig. 2. As will be noted, an external battery charging rheostat is employed to regulate the charging rate according to the size of cells under charge. The automatic cut-out is connected between the generator and the regulating rheostat, at which point the voltage is constant without reference to the number of batteries on charge. The cut-out can therefore be adjusted for this fixed generator voltage. It would be set to cut in at slightly lower than the operating voltage of the generator.

There are some battery charging outfits—mostly motor-generator sets—having generators especially designed for this service. With these outfits no external regulating rheostat is necessary as the voltage delivered by the generator can be varied within wide limits, this voltage being determined by the maximum number of batteries to be charged in series at one time. For example if two 6-volt batteries are to be charged, the field rheostat is adjusted so that the generator will deliver approximately 15 volts; likewise if four 6-volt batteries are to be charged the generator is adjusted for about 30 volts. For these conditions a switch designed to cut in at a fixed generator voltage would, of course, not be satisfactory for if adjusted for 30 volts, for example, it would not cut in when the generator voltage was lowered to 15. It would therefore not protect the battery.

By slight modification the type of cut-out used for constant voltage service can be arranged for variable voltage service. This modification consists of inserting a resistor in series with the shunt or potential coil of the switch, with a means of varying the resistance and therefore the cutting-in voltage, according to the number of batteries to be charged. This is accomplished by a switch which is operated by means of a button handle on the front of the cut-out. A dial and pointer are provided to indicate the position of the switch. These special features are illustrated in Fig. 3. This pointer is set at points 1, 2, 3 or 4, depending on the number of 6-volt batteries it is desired to charge in series. The equivalent in 12-volt batteries can also be charged. For example, to charge two 12-volt batteries the pointer would be set at 4 and so on.

The operation of the switch is not in any way

effected by adding the series resistor. At any of these settings the switch will open on a very small reverse current. It will also automatically cut in or close the circuit when normal conditions are restored.

These cut-outs are especially useful in connection with motor-generator sets for by using them charging can be done day or night with absolute safety and without the presence of an attendant. Most small motor-generator sets are equipped with polyphase motors or with single-phase motors of a type that do not require any external starting devices. In case of failure in the line voltage the motors will stop but will start up when the supply voltage is again restored. The cut-out will protect the batteries and restore the charging current at the proper time. Further with reverse current and low-voltage cut-outs there is not any danger of the polarity of a compound-wound generator being reversed so that it will generate in a reverse direction and injure the battery plates when the power comes back on the line. By selecting cut-outs of the proper ampere rating, any number of battery circuits can be charged in multiple, providing the generator is of sufficient capacity.

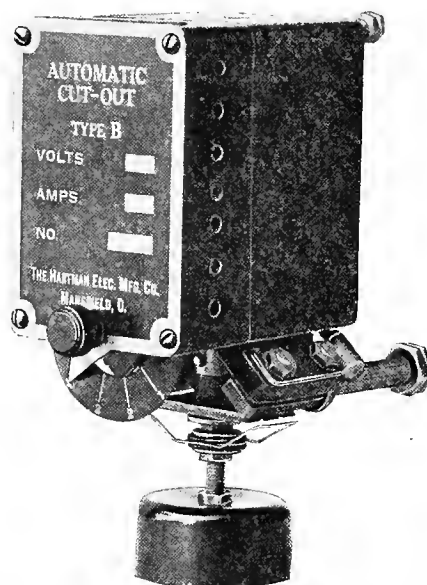


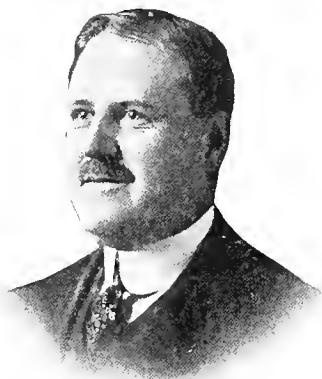
Fig. 3. Automatic Cut-out for Variable Voltage Service

The low-voltage and reverse current circuit breakers listed under paragraph (c) give the same degree of protection as the automatic switches just described but will not automatically close. After having opened these breakers will remain so until manually closed.

So far in this discussion only those protective devices which operate on direct current have been mentioned. With motor-generator sets, it is also possible to use a form of protective device that is connected both with the alternating and direct-current side of the set. One form of device used for this purpose consists of an alternating current relay or contactor having the operating coil connected directly across the line supplying the motor and a set of switch contacts in series with the battery circuit. The alternating and direct-current parts are of course insulated from each other. When the alternating voltage fails, the relay opens the battery circuit and when the circuit is again restored closes the battery circuit. Its action is automatic just as are the switches already described.



FRANK SOMERS, President of the California Association of Electrical Contractors and Dealers. Witty and neved to keenest action, Colonel Somers, as the presiding genius of the convention, won the admiration and good will of all beholders.



H. F. JACKSON, President and General Manager of the Sierra & San Francisco Power Company, and President of the Pacific Coast Section N. E. L. A. The workers of the convention were vividly taken back to the delightful days at Riverside as Captain Jackson pictured the beautiful and effective work of the Pacific Coast Section N. E. L. A. and reminded his hearers of their eligibility to membership in that organization. The increasing desire of central stations to go out of the business of retailing of appliances was also brought out and the convention responded with unusual enthusiasm when allusion was made to the growing confidence that is felt among central station managers in the ability of the contractors and dealers to handle their own problems and the growing willingness of the central station to withdraw from this conflicting field of endeavor.



CARL E. HEISE, Western Manager of the Westinghouse Electric & Manufacturing Co. In handling the delicate subject as to why manufacturers must, for some lines of apparatus, maintain an effective sales service, and not turn the work over to the jobber, or dealer, Mr. Heise presented his points so clearly and so fairly that a much stronger spirit of co-operation and a clearer understanding between contractor dealer and manufacturer must perforce result in the future.



W. S. BERRY, Western Salesmanager Western Electric Company. In his characteristically helpful manner Mr. Berry brought out a new idea, the study and practice of which will undoubtedly vastly forward the substantial financial footing of the electrical contractor in the West by putting into application bids similar to the Nelson Form for choosing bidders and awarding contracts as now so effectively in vogue in certain eastern centers.



R. M. ALVORD, Supply Manager San Francisco office General Electric Company, and President of the San Francisco Electrical Development and Jovian League. In discussing the paper on the diversified problems of electrical contracting, Mr. Alvord struck the keynote of the convention best expressed in his own words: "We profit as we serve."

CALIFORNIA ELECTRICAL

A NOTEWORTHY CONVENTION INDUSTRY

The convention of the California Electrical Contractors' Association held at Santa Cruz, July 11-14, 1917, added a distinct contribution to the advance of the electrical industry in the West. The convention was a notable one from every view point. Not only was it the largest in the history of the association but the character of papers read and the wide discussion, largely participated in not only by electrical contractors but by manufacturers, manufacturers' agents, jobbers, central station men and other representative men of the electrical industry throughout the West.

The paper of H. A. Lemmon on newspaper advertising was of exceptionally high order, as also were those of H. C. Reid on business phases of electrical contracting and dealing, Louis Levy on retailing and merchandising, and C. F. Butte on the diversified problems of electrical contracting. Two of these papers appear in full in this issue of the Journal of Electricity. The other two will appear in the issue of August 1, 1917.

Many other helpful papers were presented at this convention among which should be mentioned the papers of W. H. Gribble of Chicago on merchandising and Professor C. C. Staehling on accounting.

The afternoon session, devoted to the problems that deal with the electrical industry as a whole, brought out an unusually spirited discussion by men of the electrical industry. The crux of this discussion is summarized with the captions that appear on this page under the photograph of a number of the men that took part in this symposium.

The social gatherings and banquet were well attended and men of the industry were drawn closer in touch by the many informal occasions presented themselves for personal contact with each other. Albert Elliott, secretary of the Pacific Coast Electrical Supply Jobbers' Association, gave a masterful address at the banquet on present world conditions. Samuel A. Chase, assistant to the manager of the Supply Department of the Westinghouse Electrical Manufacturing Company, in a few fitting remarks brought greetings from the East, while Tracy Bibbins, president of the Pacific States Electric Company, responded to the call of Toastmaster Somers by a well-chosen story. But the hit of the banquet took place some minutes previous to this when one of the entertainers gracefully chose Mr. Bibbins as the most dignified banquetter of the evening and introduced him, much to the enjoyment of those present, to some new idea in the terpsichorean art. Many other pleasing incidents happened at the convention, not the least of which may be recalled the experience of C. B. Kenny in operating the elevator of the Casa del Rey at three o'clock in the morning.

TRACTORS' CONVENTION

TO THE ELECTRICAL THE WEST

To M. A. De Lew must be given much of the credit for the splendid manner in which the convention as a whole was scheduled. In appreciation of his excellent services, the convention presented him with a handsome gladstone bag at the banquet. To Mrs. Frank Somers a beautiful gift was given in appreciation of the unselfish manner in which the ladies had throughout the year assisted the husbands of the association in the good work for the convention.

The kindly co-operative work of the central station men represented at this convention was exceptionally noticeable, practically all of the larger power companies participating, as may be gleaned from the prominent array of names that appear in the register under the heading of central stations.

The new officers of the association and attendance at the convention are in detail as follows:

President—H. C. Reid, San Francisco.

Secy-Treas.—J. W. Redpath, San Francisco.

Executive Committee

M. A. De Lew, T. J. Bennett, San Francisco; R. Oyler, J. Gensler, Oakland; Goold, Stockton; W. E. Hayes, Santa Rosa; C. E. Turner, Sacramento; R. F.

Ryan, Redwood City; W. E. Cox, Santa Cruz; H. H. Courtright, Fresno; G. E. Arbogast, Los Angeles.

Stockton

D. Bass and wife, Com'l Elec. Co.
W. Hild and wife, Elec. Mach. & E. Co.
F. Flanagan and wife, Elec. Eng. & Sup. Co.
V. Dobson.

R. Goold and wife, Goold & Johns.
C. J. Franke and wife.
B. Vancott.
Miss Mitchell.
C. O. Gould, Gould the Light Man.

San Mateo

G. Loveland.
Cohn, Atlas Electric.

J. A. Foster.

San Joaquin Valley

O. Delano, Cen. Cal. Elec. Co., Lindsay.
H. Penneman, United Elec. Co., Taft.
H. Courtright and wife, Valley Elec. Supply Co., Fresno.
W. Lewis and wife, Lewis Elec. Co., Fresno.
M. Robinson and wife.

E. E. Elzea and wife, Central States Elec. Co., Fresno.
H. C. Nutt, E. M. M. Service, Exeter and Lindsay.
S. E. Nutt.
T. H. Curry and wife.
J. A. Ulmer.

Santa Cruz

E. Cox and wife, Cox Elec. Co.
Johnson and wife, Cox Elec. Co.
A. Cain, Cain Elec. Co.

R. F. Geyer, City Electrician, Santa Cruz.
Miss C. F. Howe, guest.

Oakland

W. Bernhard and wife, Bradshaw Elec.
R. V. Oyler and wife, Capitol Elec. Co.
W. L. Mitick.
R. E. Conrad and wife.
Norman Ellis, Oakland Elec. Co.

W. Bernhard and wife, Bradshaw Elec.
R. V. Oyler and wife, Capitol Elec. Co.
W. L. Mitick.
R. E. Conrad and wife.
Norman Ellis, Oakland Elec. Co.

Sacramento

V. Schneider and wife, Elec. Supply Co.
E. Schmeiser.
C. Hobrecht, J. C. Hobrecht & Co.

F. T. Wallace, Nevada Elec. Co.
Mr. Brockway, Latourette-Fical Co.
J. A. Woods, Cal. Mech. & Elec. Eng. Co.



H. C. REID, the newly-elected President of the California Association of Electrical Contractors and Dealers. The earnest personality of Mr. Reid has long been felt for good in the affairs of the electrical industry and all well wishers of the association see in the year's administration ahead a term of unexampled usefulness under his wise and thoughtful supervision.



C. F. BUTTE, of the Butte Electric Co., San Francisco. Mr. Butte's paper on the diversified problems of electrical contracting brought out a series of interesting discussions that called into play representatives from all phases of the electrical industry, the result of which will forward still further the well-recognized spirit of co-operation among electrical men of the West.



DAVE HARRIS, Vice-President Pacific States Electric Company. That the greatest asset of the electrical contractor is confidence was forcefully brought out by Mr. Harris, who showed that confidence is to be gained by a true study of efficiency: "Efficiency, founded on intelligence must become the keynote of our future business success."



ARTHUR KEMPSTON, Chief Electrician of the City of San Francisco. Mr. Kempston showed in his remarks how the spirit of co-operation among electrical men in the West had progressed from the idea of aloftness held by the inspector best summarized in the former words "Aw, go on kid, do it again and learn yourself," to that of the splendid spirit of unity and mutual helpfulness that now exists in all the work of the city electricians of the West.



ROBERT L. ELTRINGHAM, Electrical Engineer for the California Industrial Accident Commission. How the splendid work for safety in the industries of the West may be vastly forwarded by the spirit of co-operation was brought out by Mr. Eltringham, who forcefully stated that the law-abiding contractor who abhorred short-cuts in his work and looked toward the betterment of the elements of safety in the product of his hands would in the long run be the man that best bettered himself and that best advanced the standing of the industry as a whole.



THE CONTRACTORS' BABY DOLL.—Never before in its history could the contractor be said to have been more "aboard," heart and soul, than at the inspiring convention at Santa Cruz—inspiring not only to the contractor but to all men of the electrical industry that were present.

San Francisco

M. L. Scobey, Home Electrical.
W. J. Hemington, City Protective Elec. Co.
C. B. Kenny, Ne Page, McKenny Co.
P. F. Decker and wife, Decker El. Con. Co.
Mrs. Drew.
O. Kurtz, Electrical Contractor.
Mrs. C. D. Herbert.
G. D. F. Smith, Kohlwey, Smith & Alfs.
W. H. Kirsten.
C. F. Butte, Butte Eng. & Elec. Co.
B. J. Doherty.
W. D. Kohlwey and wife, Kohlwey, Smith & Alfs.
E. W. Lauer, Rex Elec. Co.
C. Collonan, Collonan Elec. Co.
F. S. Thomas and wife.
Mrs. Hughes.

Louis Levy, wife and children, Levy Elec. Company.
J. W. Asher, Asher Elec. Co.
L. Asher, wife and niece.
Mr. Flatland, Globe Elec. Co.
E. E. Brown, H. S. Tittle Co.
T. J. Bennett, Rex Elec. Co.
M. A. De Lew and wife.
Miss Bernice De Lew.
C. J. Newbery, Newbery Elec. Co.
H. C. Reid and wife, Pacific Fire Ext. Co.
Miss Thurston.
C. L. Chamblin, Cal. Elec. Con. Co.
W. G. Stearns.
T. M. Stateler, Thomas Day Co.
C. S. Wolf and wife, Standard El. Con. Co.

San Jose

F. J. Somers and wife, Century Elec. Co.

Richmond

C. F. Renwick and wife, Pioneer Elec. Co. H. McDonald, Pac. Elec. & Mfg. Co.
Miss E. Renwick.

Watsonville

John Stanovich and wife. J. Schambacher.

Lodi

B. A. Smith, Wallace & Smith.

San Luis Obispo

W. V. Fisk and wife.

Monterey

D. A. Noggle, Noggle Elec. Works.

Los Angeles

A. R. Pierce, Elec. Corp., Los Angeles.
J. P. Bowden.
B. W. Whipple.
F. O. Lantz.

H. B. Woodill, Woodill-Hultz Co.
C. Loveberg.
J. A. Newton.

Chico

W. H. Gribble and wife, West. Gas & Elec. App. Co.

Jobbers

T. E. Bibbins, Pacific States Elec. Co.
A. J. Lutz, Pacific States Elec. Co., S. F.
Geo. J. Drew, Pac. States El. Co., Oakland.
D. E. Harris and wife, Pacific States Elec. Co., S. F.
F. J. Airey, Pacific States Elec. Co., Los Angeles.
A. E. Skilecorn, Pacific States Elec. Co., Fresno.
R. F. McDonald, Holabird-Reynolds Co.
H. A. Sayles, Holabird-Reynolds Co.

W. D. Thomas, Elec. App. Co.
C. J. Winslow, Elec. App. Co.
A. Meinema, Elec. App. Co.
F. J. Cram, Elec. App. Co.
W. L. Neelands, West. Elec. Co.
W. S. Berry, West. Elec. Co.
M. S. Orrick, West. Elec. Co.
W. Todd, West. Elec. Co.
E. R. Murray, West. Elec. Co.
D. J. Butts, Western Elec. Co.
C. C. Davis, Pacific Hardware & Steel Co.

C. E. Wiggin, D. C. & H. Co.
A. H. Nylen, Gilson Elec. Co.
G. E. Arbogast, Newbery Elec. Co.
Ross Hartley, Illinois Elec. Co.
A. Youngholm, Elec. Rys. & Mfrs. Sup. Co.
C. J. Thelan, Elec. Rys. & Mfrs. Sup. Co.
H. H. Hoxie, Elec. Rys. & Mfrs. Sup. Co.
P. G. Gough.
A. P. Peck, Holabird-Reynolds, Sacramento.

Manufacturers and Manufacturers' Agents

F. H. Thrall and wife, Roberts Mfg. Co.
P. H. Affolter, Garland-Affolter Eng. Co.
R. M. Alvord and wife, Gen. Elec. Co.
C. F. Försberg, Gen. Elec. Co.
E. E. Boyd, Gen. Elec. Co.
E. L. Nightingale, Gen. Elec. Co.
C. F. Kirkpatrick, Edison Lamp Works.
W. A. Fagan, Edison Lamp Works.
T. W. Simpson, Federal Sign System.
W. A. Thompson, Federal Sign System.
E. A. Hansen, H. B. Squires Co.
C. A. Gray, Crouse-Hinds Co.
J. W. Thompson, Johns-Manville Co.
S. P. Russell, Johns-Manville Co.
A. E. Drendell and wife, Drendell Elec. & Mfg. Co.
C. O. Martin, Benjamin Elec. Co.
M. F. Steel, Benjamin Elec. Co.
A. E. Rowe, Tel. Elec. Equip. Co.
Garnett Young, Tel. Elec. Equip. Co.

I. J. Francis, Roebbling & Sons.
F. A. Devlin, Roebbling & Sons.
A. T. Brown, Roebbling & Sons.
H. E. Sanderson, Bryant Elec. Co.
W. G. Stearns, Stan. Underground Cable Company.
F. G. Beck, American Everready.
Geo. A. Koch, American Everready.
J. A. Vandegrift and wife, Oakland Division Mazda Lamp Works.
C. R. Hunt, Robbins & Myers.
C. E. Heise and wife, West. Elec. & Mfg. Company.
S. A. Chase, West. Elec. & Mfg. Co.
E. M. Cutting, Edison Storage Battery & Supply Co.
C. D. Herbert, Westinghouse Elec. & Mfg. Company.
R. A. Balzari, Westinghouse Elec. & Mfg. Company.

Clark Baker, Oakland Div. Mazda Lamp Works.
R. Wolfsberg, Elec. Agencies.
B. A. Wagner, Elec. Agencies.
J. H. Jamison, Westinghouse Elec. & Mfg. Company.
W. R. Dunbar, Westinghouse Elec. & Mfg. Company.
J. P. Hermans, Westinghouse Lamp Co.
S. B. Gregory and wife, Arrow Elec.
G. Battee, Bittman & Battee.
H. H. Hughes, Westinghouse Elec. & Mfg. Company.
J. H. Lavensen, Alexander & Lavensen.
Max Loewenthal, United Trading Co., San Francisco.
W. C. Wurfel, Westinghouse Lamp Co.
L. E. Sperry, N. Y. Ins. Wire Co.

Central Stations

S. V. Walton, P. G. & E. Co.
L. H. Newbert, P. G. & E. Co.
A. W. Childs, So. Cal. Edison Co.
H. A. Lemmon, Truckee River, G. E. Co.
H. P. Pitts and wife, P. G. & E. Co.

H. F. Jackson, Sierra & S. F. Power.
W. McKinley, Sierra & S. F. Power.
Chas. Northcutt, Sierra & S. F. Power Co.
L. E. Woodbridge, Sierra & S. F. Power Co.
N. F. Neiman and wife, Univ. Gas & Elec.

H. E. Grant, Universal Gas & Elec.
W. S. Leffler, Great Western Power Co.
E. B. Criddle, Southern Sierras Power Co.
A. W. Childs, So. Cal. Edison Co.
J. G. Pomeroy, So. Cal. Edison Co.

Miscellaneous Guests

Robt. L. Eltringham and wife, California Industrial Accident Commission.
Albert H. Elliot and wife, Secretary Pacific Coast Elec. Sup. Jobbers.
A. Kempston, City Elec. Eng., S. F.
C. W. Mitchell, Elec. Eng., Pacific Board of Underwriters.
E. Brettell and wife, Vancouver, B. C., Electrical Contractor.
J. H. Sproufe, Portland, Elec. Contractor.

H. C. Rohrback and wife, Tacoma, Elec. Contractor.
J. P. Ne Page, Seattle, Ne Page, McKenny, Company.
C. C. Staehling, University of California.
R. Shibley, Journal of Electricity.
A. H. Halloran, Journal of Electricity.
J. W. Redpath and wife, Secretary California Contractors' Association.
H. A. Lemmon, T. R. Gen. Elec. Co., Reno, Nevada.

Mrs. Doran, entertainment committee, representing Santa Cruz. Cham. of Com.
R. L. Cardiff, entertainment committee, representing Coast Counties Gas & Elec. Co., Santa Cruz.
Miss Thurston, entertainment committee, representing Coast Counties Gas & Elec. Co., Santa Cruz.
Mrs. Pauline Lary, entertainment committee, Los Angeles.

FUEL OIL AND STEAM ENGINEERING

(Recent practice in fuel oil economy makes necessary a better understanding of the fundamental parts of the boiler shell and its accessories with especial reference to heat insulating and heat transmitting characteristics of the boiler shell. In this discussion the authors first establish the fundamental principles of steam generation, then the laws of heat transmission through the shell are set forth. The discussion concludes with a description of the leading accessories that go to make up the modern boiler equipment.—The Editor.)

THE BOILER SHELL AND ITS ACCESSORIES FOR STEAM GENERATION IN FUEL OIL PRACTICE

BY ROBERT SIBLEY AND CHAS. H. DELANY



The Clean, Clear Cut Appearance of the Oil Fired Boiler Room

LET us now consider some of the fundamental laws involved in heat transference, and then discuss the container or shell employed in steam generation together with the accessories that must accompany any high pressure steam generating unit to accomplish safe and efficient operation.

Going back once again to the homely tea-kettle for a simple illustration, we find that the container for the water and steam usually consists of a flat bottomed metallic vessel with free opening to allow the steam generated to escape to the atmosphere. There is also usually to be found an opening with a lid covering at the top where water may be passed in or the vessel cleaned at more or less irregular periods of operation in household economies.

In the case of the steam boiler, however, vast improvements in physical configuration and construction become a necessity. Let us then examine some of these differences.

The Laws of Heat Involved in Steam Generation.—The transference of heat is found by experimental observation to take place in three separate and distinct ways—namely by conduction, by radiation, and by convection.

On a wintry night if one stands in front of a blazing fireplace it is easy to find illustrations of those three methods of heat transference. Thus standing, one feels the heat radiating to his face in outward projections from the fire, for if

an article such as a solid screen, opaque to heat radiation, be placed between the face and the fire the sensation of heat on the face immediately disappears. If now from behind the screen one holds a metallic poker in the hot fire, it will not be long before the poker even at the point behind the screen becomes so hot by conduction that it cannot comfortably be held in the hand. And finally should a sudden gust of wind blow down the chimney a hot gust of air may be driven out into the room and around the screen to the observer's face, thus illustrating the transference of heat by convection.

The Principle of Operation of the Steam Boiler.—

Let us then see how these three methods of heat transfer are utilized in modern boiler operation.

As has been previously noted, the burning of the fuel in the furnace causes enormous quantities of heat to be given out in the furnace space. This heat is immediately absorbed by the furnace gases, thereby raising them to a high temperature. By convection currents, and also by radiation, this heat is now transferred to the outer surface of the boiler shell and tubes containing the water that it is desired to convert into steam. The metallic shell and water tubes having now absorbed the heat, convey it to their inner surface by conduction where it is transferred to the water in the boiler. This water, becoming heated, expands, and, due to its lighter density thus created is



A NEW ADVANCE IN OIL FIRED BOILER ACCESSORIES

Here is a picture of the boiler fronts of the new Bush street station of the Great Western Power Company, described in the Journal of Electricity, July 15, 1917. Note the master controller, the automatic regulator at the burner, the regulator for the ash pit and damper control, and the piping arrangement that crosses the boiler points, all of which are utilized in securing an economic control of the burning of oil with its proper mixture of air. Such illustrations as this indicate the delicate control under which recent advances in fuel oil economy have made the operation of the modern oil fired boiler a mechanism of extreme sensitiveness.

forced to go to the top of the water surface to make way for cooler, heavier water which in turn absorbs heat and disappears to make way for other water. This last activity is evidently again transference by convection currents and such a movement of water is called circulation. The efficient manner in which this circulation takes place has much to do with the economic operation of the boiler.

Mathematical Equation for Heat Transference.—

In 1909 Dr. Wilhelm Nusselt of Germany devised a formula whereby the factors involved in the rate of transference of heat are set forth quantitatively. This formula reduced to English units by the Babcock and Wilcox Company in their book on Steam is as follows:

$$a = 0.0255 \frac{\lambda_w}{(d)^{.214}} \frac{(Wc_p)^{.786}}{(A\lambda)} \dots\dots\dots (1)$$

Wherein a is the transfer rate in B.t.u. per square foot of surface per degree difference in temperature; W is the weight of pounds of the gas flowing through the tubes per hour; A is the area of the tube in square feet, d is the diameter of the tube in feet; c_p is the specific heat of the gas at constant pressure; λ is the conductivity of the gas at the mean temperature and pressure in B.t.u. per hour per square foot of surface per degree Fahrenheit drop in temperature per foot; and λ_w is the conductivity of the steam at the temperature of the wall of the tube.

Mathematical Law for Total Heat Absorption.—

The application of this formula is cumbersome and indeed upon careful analysis it is seen to be largely empirical in its nature. Let us then cast about for another equation.

Stefan's law sets forth that the heat absorbed per hour by radiation is proportional to the difference of the fourth powers of the absolute temperature of the furnace gases T and the absolute temperature of the tube surface t of the boiler. In addition to this if we add the loss of heat given up by the outgoing gases due to their cooling from the absolute temperature T_1 to the absolute temperature T_2 on the assumption that the boiler tubes have absorbed all this heat, we have for the total heat absorption

$$E = 1600 \left[\left(\frac{T}{1000} \right)^4 - \left(\frac{t}{1000} \right)^4 \right] S^1 + WC(T_1 - T_2) \dots (2)$$

In which E is the total evaporation of a boiler measured in B.t.u. per hour, S^1 is the area of boiler surface, W is the weight of gas leaving the furnace and passing through the setting per hour, and C is the specific heat of the gas.

Relationship of Rate of Heat Transfer.—By means of the integral calculus it may now be found from the above equation that the rate of heat transfer R may be expressed by the equation

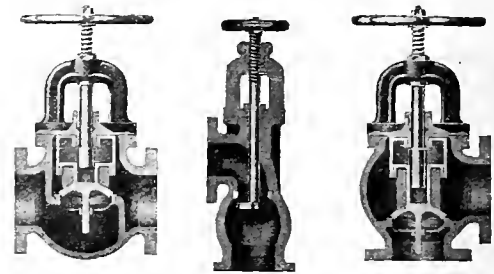
$$R = \frac{WC}{S} \log_e \frac{(T_1 - t)}{(T_2 - t)} \dots\dots\dots (3)$$

This law shows an important relationship of temperatures whereby we may design condenser shells as well as boiler shells to accomplish a maximum rate of heat transfer.

In the Babcock and Wilcox type of boiler the constants involved in heat transference have been quite accurately ascertained. By substituting these constants the above equation is found to reduce to the simple relationship:

$$R = 2.00 - .0014 \frac{W}{A} \dots\dots\dots (4)$$

Necessity for Boiler Accessories.—Since the modern boiler operates under pressures and temperatures far in excess of the tea-kettle and since the quantities of water involved are far beyond hand operation,



Stop, Check, and Blow-off Valves

the necessity for the creation of accessories to properly care for these increased responsibilities early became apparent in the evolution of steam engineering.

Injector or Pump for Feed Water Supply.—In order to supply the boiler with the necessary water involved in steam generation the injector has made its appearance in some instances, while feed-water pumps are used in other instances.

Since the modern boiler operates at from 100 to 275 lb. pressure per sq. in., it is evident that the water must be forced into the boiler, for no ordinary water supply is obtainable to meet such adverse pressures.

The type of pump most frequently met with for boiler feed purposes is the ordinary duplex double acting pump in which the steam cylinder is made larger than the water cylinder to enable the water to be forced into the boiler at a pressure greater than that of the steam itself. Pumps of this type are very reliable and if chosen of sufficient size so they can be operated at slow speed give excellent satisfaction.

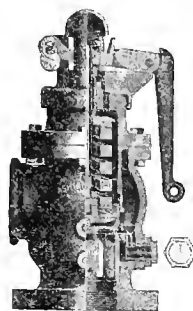
For large power plants the centrifugal pump is coming into favor owing to the small space it occupies and the small attendance required. It is built in four, five or six stages, depending on the water pressure required, and may be driven by either an electric motor or a small steam turbine.

The operation of the injector is accomplished by drawing a certain amount of steam from the boiler and allowing it to attain an enormous velocity. This steam then comes in contact with the feed water supply which at once converts this impinging steam into water. The immense impetus of the outflowing steam and the conversion of the latent energy of this steam into kinetic energy of motion causes the feed water to be sucked in and driven against the check valves of the boiler with such force as to overcome the opposing pressure and allow such water to enter as may be needed.

The injector is limited in its field of operation by the fact that the water must be cold enough to con-

dense the injected steam—in other words the injector cannot pump hot water. As the hotter the feed water the more economical the plant the injector is only suitable in plants where there is no hot water available. This condition exists on the locomotive where the injector finds its greatest usefulness.

Check and Non-Return Valves.—In order that no water should flow back out through the entrance valve, some means must be provided. Many types of valve are used in practice to perform this function. An illustration of a typical type of check valve is shown in the picture exhibited herewith.



Pop Safety Valve

be determined in advance for any desired pressure in the boiler.

Manholes.—To clean and examine the boiler interior some means must be provided by which access may be had to its interior. On all modern types of boilers will be found man-holes and hand-holes whereby this access may be obtained when occasion arises.

Provision for Expansion.—The excessive temperatures under which a boiler operates and the sudden change from one temperature to another make it absolutely imperative that some means be provided to take care of uneven expansion in its parts. Most boilers on the market do not for this reason allow the boiler shell to rest upon the furnace structure, but on the other hand the boiler is suspended from above and all suspended parts are allowed to swing free with ample clearance between them and the brickwork. The care with which uneven expansion and its disastrous results are provided for makes much for efficient boiler design.

The Mud Drum.—Since all water contains a certain amount of impurities, some space must be set aside for the collection and segregation of these impurities. Such a compartment is known as the mud drum. This is cleansed at definite periods by blowing down the boiler, that is by opening the blow-off valve at the bottom of the mud drum and allowing some of the water to escape from the boiler into the atmosphere.

Having now a general ground work of boiler shell characteristics in their relation to heat transfer, and bearing in mind the accessories that must accompany the modern boiler, we shall next consider the commercial type of boiler and its classification.

Perhaps an imitation of some of Brazil's up-to-date methods would bring Americans to an every day use of the metric system. The city of Pernambuco, Brazil, is at present installing a new system of street numbering. It appears to be simple and practical and an improvement over the old system of numbering. To explain briefly, if the number of a house is 134, for example, then the number on that particular house is 134 meters from a certain starting point. The house across the street would be 135 meters or the nearest number to the actual distance from the starting point. The system is being used in several cities in southern Brazil, having been first tried in the city of Bello Horizonte.

The Steam Gage and the Water Gage.—In the operation of the tea-kettle the escaping of the steam into the atmosphere readily prevents the possibility of explosion, and the ever watchful eye of the attendant is utilized to see to it that the water supply is sufficient for safe operation. The use of high pressures and inclosed boiler shells makes it imperative in steam engineering to have some means of ascertaining the pressure under which the boiler is operating and to determine the height of the water in the boiler shell. The steam gage meets the former requirement. This type of instrument was described in the chapter on pressures.

To ascertain the water level in the boiler shell, the installation of water columns enclosed in glass tubes makes visible the height of the water in the boiler. The water column is located so that its center is at about the proper height of water in the boiler. The upper end of the column is connected to the steam space of the boiler and the lower end to the water space, so that the water in the column always rises to the same height as the water in the boiler. The bottom of the glass must be a little higher than the lowest level at which it is safe to carry the water to prevent damage by overheating the sheets or tubes, and the top of the glass must be a little lower than the level at which water would begin to be lifted and carried out with the steam. Pet-cocks are provided so that the water column may be cleaned of sediment at frequent intervals to insure its safe and accurate operation. Since the ascertaining of the exact water height in the boiler is of such vast importance, three additional pet-cocks called Gage Cocks are usually installed near the water glass. One of these is located above the proper water level, the second at about the water level, and the third below it. Hence, upon trial if the boiler is properly operating, the first should emit colorless dry saturated steam, the second water vapor and the third hot water.



Siphon for Keeping Steam Gauge Dry

Safety Valve.—All boilers are definitely standardized so that steam generation must not exceed a

certain pressure development. To prevent this excessive generation of pressure a safety valve is always installed. These are in general of two types, the one having its outlet to the outside air controlled by a spring set for the pressure desired, the other controlled by a weight and lever arm set for the blow-off pressure desired. Since the total pressure required to open the valve equals its area in square inches times the pressure in pounds per square inch the compression in the spring or the weight on the lever may

N. E. L. A. DONT'S FOR THE SALES BUREAU

Taking up the subject of personal appearance, it would be poor policy for the solicitor to call on a prospective customer with two or three days' beard bristling on his chin in a belligerent manner. It would look as though he would give a customer's order very poor attention should his shoes be in need of a 5-cent investment of elbow-grease. While it is not possible for all of us to wear excellent clothes, we should at least be able to have them properly pressed, and it is only a small matter of 3 cents a day to have our collar fresh and clean every morning and it is not absolutely necessary to go to a manicure parlor to have the daily accumulation removed from one's finger nails.

I am a great believer in personal appearance and the impression made by the initial call. You can readily see that it would be very unfortunate for the salesman to appear to have neglected to comb his hair or to allow his teeth to get into such a condition that their offensive appearance would distract the mind of the prospective customer from the subject the salesman was talking about, and these many details if properly looked after will very often change a mediocre to a fairly good salesman.

Don't at any time become "fresh" with your customer, as his natural politeness may lead you to believe that he has not noticed it. You can rest assured, if you could see his mind, you would know that he resented it.

Don't under any circumstances use profane language to emphasize your point.

Don't think that it is necessary for you to entertain him by telling obscene stories. These are unnecessary and in bad taste.

Don't be servile in your attitude or language, but don't be curt to the point of being discourteous.

Don't forget that the customer, particularly when he is older than yourself, is entitled to the title of "Mr."—as you will in this manner no doubt be able at a later date to become well enough acquainted to eliminate it without losing any prestige.

Don't under any circumstances start to speak while your prospective customer is talking to you, as you will immediately give him the impression that you are paying no attention to what he is saying but are thinking only of your own selfish purpose.

Don't blurt out something without first thinking how it will sound, as words once dropped from the lips cannot be recalled.

Don't drink intoxicating liquor while on duty. I am not a temperance crank myself, but I very much object to getting the drink almost second-hand. By this I mean, the salesman in talking to the customer sometimes gets close enough so that his breath if charged with alcohol would be quite noticeable and objectionable. This also goes for onions and chewing tobacco.

Don't think that it is necessary when you come into a man's office to hitch your chair up so close to him that you make him feel like moving back from his desk.

Don't under any circumstances feel that it is necessary for you to emphasize your point by tapping him on the arm, or, if you are sitting close, tapping him on the knee, or laying your hands on him in any manner. If you must gesticulate like a wind-mill to emphasize

your argument confine your actions to the use of a lead pencil, and if you are talking from a report, you can very easily tap on the item question without making it offensive.

Don't mistake your customer's desk for a hat rack, and don't under any circumstances call on a customer without first throwing away your cigar or cigarette.

Don't force yourself in to see a customer no matter as the case may be; and until you are fairly well acquainted with a customer it is not necessary to offer him a cigar; and I consider it extremely inadvisable to ask a customer during business hours to have a drink, no matter how important you think it may be when he has said very emphatically that he does not wish to see you that day. This is a point where it rests with the salesman's judgment. In some cases it may be well to force the call, but in many cases it would be much better to keep persistently calling and studying the prospect's disposition so that you will be able to grasp the opportune moment.

To close this article, a little word of caution may be added to keep some enthusiastic salesman from talking himself out of an order. There is a point where the customer is willing to place his name on the dotted line and there is a point just beyond that at which either your appearance, speech or actions will cause him to change his mind. I have given a few of the lessons that each one of us must study carefully to see how we can eliminate our faults.

THE GREATEST GAS WELL FIRE IN HISTORY

The greatest gas well fire in history after burning nearly a quarter of a billion cubic feet at a loss of four and one-half million dollars in five and one-half days, was recently put out by Deputy Chief William Guerin, of the New York Fire Department, in five minutes.

The well is located seventeen miles west of Monroe, La., and is owned by the Ouchita Natural Gas & Oil Company. It had been flowing at the rate of 44,000,000 cubic feet a day under a head pressure of 1500 lb. to the square inch.

In describing the work Mr. Guerin said:

"After looking over the situation I decided that the problem was exactly the same as one that I had faced in the New York Fire Department. The only difference was one of degree.

MAMMOTH TUNNELS OF HETCH HETCHY OPEN TO BIDS

City Engineer O'Shaughnessy has sent from Hetch Hetchy the plans and specifications for eighteen and a half miles of Hetch Hetchy tunnels, which it is estimated, will cost \$6,200,000.

While the bonds have not been sold to pay for the work, indications have made the administration hopeful that the money will be on hand by the time the contracts have been awarded.

One of the tunnels will rank among the longest in the world, being slightly over 14 miles in length. There are two tunnels making up the eighteen miles that will be worked in three sections.

The inside dimensions of the tunnels will be in the shape of a horseshoe, 10 ft. 3 in. high and 10 ft. 3 in. wide. It is expected that the work will take approximately two years.

SPARKS—Current Facts, Figures and Fancy

(The stress of world conditions thrust upon America has made necessary the putting under of vast agricultural acreages hitherto unattempted. In England a movement is afoot to bring the electric plough into its own. The vast areas of the West served by hydroelectric power offer opportunities in a favorable light encountered nowhere else in the world for the supplying of electricity to the farm. Notations on the electric plough and other comment of present day status of the electrical industry may be gleaned on this page.—The Editor.)

Electricity took another step forward recently when the giant electrically propelled battleship New Mexico was launched from the New York Navy Yard.

* * *

As a little side light on road building behind the lines of the allies in France it may be stated that fifty thousand tons of stone weekly are required to mend the roads.

* * *

Even the "wise men" in the East must now admit the profitable side of irrigation. An irrigated acre in New Jersey recently brought forth twenty-one hundred dollars in produce.

* * *

According to Professor Elihu Thompson, a past president of the American Institute of Electrical Engineers, success in life is won by enthusiasm and the habit of constant thought.

* * *

Within recent years the efficiency of the electric motor has been gradually increasing until today these efficiencies run from eighty-three per cent in the fractional horsepower to ninety-three per cent in the large motors.

* * *

The increasing necessity that the American engineer familiarize himself with the metric system due to new world conditions thrust upon him is evident on all sides. Can you think in hectares, kilometers and grams? Better practice up.

* * *

The Mississippi River Power Company at Keokuk, Iowa, has installed the largest graphic meter in the world. The meter has a capacity of a quarter of a million kilowatts and draws the output curve of the entire station on a single chart.

* * *

The West may now claim a new record. The general public served by one of its great hydroelectric institutions—The Pacific Gas & Electric Company—is a greater holder of stock quantitatively and numerically than any other district served by a utility company in America.

* * *

An instance of the unprecedented proportions to which electricity has risen in the shipbuilding of the nation is that of the recent investment of twenty million dollars by the Bethlehem Steel Company in electrically operated steel and shipbuilding plants for the United States government and its allies.

* * *

A movement is on foot in England to speed up the use of the electrical plow. It would seem that our great hydroelectric companies of the West have been

extremely backward in this regard as untold opportunities await the efficient evolution of the electrical plough in this section where such gigantic water powers are available.

* * *

The ranks of filmdom's stars have a new recruit—the Imperial Valley canteloupe. Moving pictures, electrically operated, showing the extent of the new industry, and the extraordinary care taken in seeing that the melons are carefully transported to all portions of America, have been taken, and will shortly be shown all over the country.

* * *

Electricity is playing a leading role in the gigantic shipbuilding that is now under way on the Pacific Coast. The application of electric power to overhead traveling cranes, aerial handling systems, circular cranes, shop machinery, cable conveyors, and for lighting shops and yards, represent the best practice and embody many features of special interest.

* * *

Kipling says: "When the waters were dried and the earth did appear, The Lord He created the Engineer." It was not until recently, however, that the electrically operated pump has made possible the return of these waters to the earth at proper intervals and thus perfect the grandest piece of creative work yet accomplished by man—the modern intensively cultivated farm in the West.

* * *

According to experts of the United States government, the country is at present not supplying 10 per cent of the platinum it requires. It has been urged that platinum dealers and producers inform the government fully regarding the available reserves of this highly important metal, as a patriotic duty. As a "war metal" platinum becomes particularly important in the manufacture of sulphuric acid and chemical utensils, both of which have a direct bearing on the production of high explosives and other necessary war supplies.

* * *

Among the many ultra-modern appliances of the great Southern Pacific Building in San Francisco which make the new office structure a model of its kind, is a pneumatic tube delivery system modeled on the lines of a telephone exchange. If a clerk in the department of freight accounts desires to refer a way bill to a special accountant four floors above him, instead of summoning an office boy, he puts the way bill in a mailing carrier, dispatches it to "central" and the latter after glancing at the destination shown on the indicator, shoots it to the proper office, all in the space of a few seconds.

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CONTENTS

A Successful Electric Truck Delivery Service. <i>By F. D. Weber</i>	97
Radiation Correction for Throttling Calorimeter.....	99
Diversified Problems of Contractor and Dealer. <i>By C. F. Butte</i>	100
Is the Regulation of Public Utilities a Success?.....	103
Electricity Supreme in Gold Dredging.....	104
Retailing and Merchandising. <i>By Louis Levy</i>	106
Pumping Plants of the U. S. Reclamation Service. <i>By S. T. Harding</i>	106
The Bonus, Water Right Value, and Appreciation. <i>By C. E. Grunsky</i>	111
Types of Practical Heat Insulation. <i>By John Crawford, Jr.</i> ..	114
New Law for Elevator Inspection.....	116
Short Journeys in Pacific Lands.....	117
Problems and Solutions.....	118
Recent Water Legislation Introduced in Congress. <i>By John A. Britton</i> ..	
Recent Fuse Practice for 2300 Volt Circuits. <i>By D. J. Butts</i> ..	
Electric Load Advantages of a Wood Pulp Paper Mill. <i>By J. W. Hungate</i> ..	
Advantages of Grounding Secondaries. <i>By C. E. Young</i> ..	
Recent Cases Relating to the Appropriation of Water. <i>By A. E. Chandler</i>	120
Protective Devices for Storage Battery Charging Circuits. <i>By George A. Schneider</i>	122
Convention of California Electrical Contractors Assn.....	124
The Boiler Shell and its Accessories for Steam Generation in Fuel Oil Practice. <i>By Robert Sibley and Chas. H. Delany</i>	127
N. E. L. A. Dents for the Sales Bureau.....	130
Mammoth Tunnels of Hetch Hetchy Open to Bids.....	130
Sparks—Current Facts, Figures and Fancy.....	131
Editorials	132
Personals	135
Trade Notes	136
A Tribute to a Western Pioneer in Engineering.....	137
Meeting Notices for Electrical Men.....	138
Latest in Everything Electrical.....	139
A Comprehensive Review of Recent Bulletins.....	140
What Western Inventors are Doing.....	142
New Electrical Developments	143

THE REWARD

It is well to remember in these days of tense activity that whether the engineer wears the regalia of the officer in the engineer corps, whether he serves as the executive of a great utility or whether his portion of life is but that of most of us simple folk, the title or office brings not the real reward. In its last analysis it is all summed up in five little words: "We profit as we serve."

Once again the principle of the inseparability of authority and responsibility has been demonstrated.

The New Shipping Board

The controversy in the national shipping board at Washington has brought out the fact that one of the world's greatest builders could not, with hands tied, proceed with the functioning of the business in hand. The West admires the dignified attitude taken by the former manager of the Emergency Fleet Corporation.

The new appointees, E. N. Hurley of Chicago, and Rear Admiral W. L. Capps, both splendid executives, meet with the sincere public approval and undoubtedly in the reorganization of the great work at hand the utmost care will be displayed in amply vesting proper authority where responsibility is placed.

The particular attention of every reader of the Journal of Electricity is especially called to the contribution by John A. Britton, the much beloved dean of the electrical industry on the Pacific Coast, that appears on page 118 of this issue.

New Legislation on Water Power

In this forceful contribution, Mr. Britton points out the salient features of the Walsh bill that is now before Congress which, if made into a law as a war emergency bill, will greatly relieve the present deplorable situation in the hydroelectric development of the West.

The editorial columns of the Journal of Electricity have frequently called the attention of its readers to this vital relief that must be had before renewed activity in hydroelectric development may reasonably be expected.

Forgetting all other considerations, however, except those of national stress under which the nation now finds itself the passage of this bill will mean much for national security.

Tersely put, it means in California alone, an immediate saving of approximately six million barrels of oil annually. Every pound of this oil possesses sufficient energy to project a human being into a skyward flight

of over eighteen miles. What would happen to the German army if such energies were properly focused?

The answer is easy, annihilation. And we are going to bring this answer into a reality by conserving our natural resources, which means the passage of the Walsh bill.

In the economic struggle between the publicly owned and privately owned utility, it has long been observed by disinterested parties that an unfair advantage has often been taken by municipal authorities in furthering the aims of a municipal project in entering the field already served by a privately owned organization.

In former years such procedure often won applause even from staid citizens of the community. In modern times, however, under the remarkable system of public regulation of utility organization and the splendid response that has been made by these utilities throughout the West the picture presents an entirely different appearance. It is of more than passing importance to note recent court decisions that affect this issue.

In handing down a recent decision in the case of the Los Angeles Gas & Electric Corporation against the City of Los Angeles, Judge Bledsoe established a precedent beyond which municipally owned utilities cannot pass in their undue treatment of privately owned companies already operating in the same territory. Thus, he said:

"I am in entire harmony with a plan of municipal improvement such as has been projected in the City of Los Angeles, and as is here under consideration. I am, however, also firmly of the belief that until the city, by purchase, appeal to eminent domain or otherwise, has lawfully and properly and justly eliminated competition, it must meet its competitors as any other private agency would be compelled to meet them, and must stand with them in the same relation to the law, and let its success be measured by its ability satisfactorily to serve the public rather than by its power through the exertion of public functions to occupy a position of supremacy in the field which it deliberately has chosen to invade."

Much has been said about the advisability of holding electrical gatherings during the coming season, so that today the conclusion is pretty clearly drawn by all clear thinkers that a getting together in

The Rewards of Convention Effort

times such as these is not only a matter of good policy or rather of putting the best foot forward but it is in fact a great necessity. If ever there exists a time for men to assemble and talk over problems of common interest in a great industry it is in times of national stress when the nation as a whole is calling for a maximum supply of power with minimum outlay of human effort and minimum consumption of fuel supply.

The recent Santa Cruz convention of the California Electrical Contractors' Association is a good instance of the rewards of convention effort. Hitherto this organization and its deliberations have represented

but a single department or development in the work of the great electrical industry. But by gathering in representative manufacturers, manufacturers' agents, jobbers, central station men and others interested in the betterment of the electrical industry this convention really became the arena for a great feast of everything that goes toward betterment of the industry.

The particularly striking feature was the spirit of candid expression of the problems that are holding up possible harmony between contractor dealer, jobber, manufacturer and central station and the evident spirit of willingness on the part of all to harmonize these activities. While it is true that the convention is now past and in the heat of business getting many of these ideals will be soon lost sight of, still the seed is sown; and it is bound to bear fruit in better and bigger business because of this very beginning in a clear spirit of co-operation so synonymous with the spirit of the great West.

Such, then, are the rewards of convention effort and it may indeed be said to repay in such instances as that at Santa Cruz an hundred fold.

The case of the Pacific Electro Metals Company in Central California against the Pacific Gas & Electric Company, the Great Western Power Company and the Sierra & San Francisco Power Company is one of unusual interest.

An Interesting Commission Hearing

The Electro Metals Company is a newly organized industrial plant situated near Bay Point, California, that is installing two 3000 kw. furnaces and three 300 kw. furnaces for the manufacture of ferro silicon products. The company has an immediate need of 10,000 h.p. and in the near future will probably require from 20,000 to 30,000 h.p. This company is endeavoring to secure a rate of \$15 per horsepower per annum for electric energy from the defendant companies, all of which contend that such a rate would be below the actual cost of service.

The hearing before the California Commission has brought out the point that under the existing contract between the Pacific Gas & Electric Company and the Great Western Power Company, the former corporation produces a minimum of 15,000 kw. at a 70 per cent load factor from the latter company at an agreed price of $5\frac{1}{2}$ mills pr kw.-hr. On the other hand the monthly power bill of the new company will probably approximate \$30,000.

John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, testified that at the present time it is impossible for his company, under existing contracts, to furnish such a quantity of power and furthermore he stated that none of the existing companies were in a position to furnish the required power.

The entrance of electro-chemical companies into the industrial life of the West has long been heralded as splendid institutions for the industrial growth of this section of the country. The Electro Metals Company is the first of its kind in North America, west of Toronto, Canada. Its entrance finds a dilemma in power supply that could not possibly be met were

it not for a fortunate grouping in the near vicinity of three of the greatest hydroelectric companies in the United States. So fast has the present industrial needs of the West grown of late that even these giant institutions will find it difficult to spare the desired power.

As to the outcome of the hearing set for August 7, it is difficult to speculate. The entire problem is one of unusual importance. The rate that will be set by the commission and its orders of service upon the various hydroelectric companies serving the community are being looked forward to with unusual interest.

The entrance of electro-chemical industries into the industrial life of the West means much for the continued growth and commercial activity of this section of the country.

Electro Chemical Development on Pacific Coast

Like other pioneer industries that have come westward, this new development must carve new fields of usefulness and must make for itself new destinies in the growth of the great Pacific area.

The very fact that 7500 tons of ferro-silicon products were manufactured last year at Welland, Ontario, and shipped over a costly routing to Vancouver, British Columbia, to be there shipped to Vladivostok, the great Russian seaport of the Pacific, indicates in a measure some of the possibilities of the future for such industries when located in the West.

The vast natural resources of chemical products in the mountain lakes and of rare metals in the bowels of the mineral districts of this section offer a flattering future for the investor.

It is, however, well recognized that hydroelectric energy must be employed to bring about this development to its highest economic degree of usefulness.

The old basis of the kilowatt hour under which power companies have been disposing of industrial loads must be somewhat harmonized with the kilowatt year or horsepower year basis of measurement before these

industries can have a fair chance of economic existence.

The entire problem is one of great importance to the power companies of the West, for in its scientific solution they will be forwarded in commercial development by acquiring very desirable steady loads, at the same time the countless secondary industries that must perforce be called into life by the production of these electro-chemical products on the Pacific Coast means much for new diversified loads of many kinds.

According to the United States commerce reports, many interesting phases of utility life are transpiring among our Pacific neighbors. The pleasing financial status of certain of the utility companies on the eastern coast of Asia comes as a great source of satisfaction to engineers throughout the West, since the passage of each month serves to find the engineering and commercial ties of all countries bordering the great Pacific cemented into a closer and more friendly relationship.

Utility Activity in the Far East

A public service corporation rarely is able, as the result of a year's business, to declare a dividend of thirty per cent on its capital stock, place one-sixth of the amount of its paid up capital to increase its reserves, write off its plant account more than one-third of the amount of its capital stock, and be compelled to call upon its patrons, the public, not to use its product so freely. Nevertheless this is the record of the Hongkong Electric Company (Ltd.), which supplies electric light and power for the principal portions of the colony as distinct from another concern which serves Kowloon and the mainland of the colony.

Such an instance as this but shows the ever-growing financial stability of the oriental trade in affairs electrical and it comes as a pleasing feature and pleasant augury of still closer engineering and commercial ties for the future.

THE NEW JOURNAL SERVICE: With an ever increasing desire to meet the present day needs of men of the electrical industry in the West, there is inaugurated in this issue a department that bids fair to prove of inestimable value to readers of the Journal of Electricity.

John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, has contributed the first article in a series of problems and solutions that will occupy a department in each issue of the Journal of Electricity. Other prominent men of the industry have signified their willingness to assist in this great work of briefly expressing their views on perplexing problems that may be asked for solution through this department.

In the issue of August 15, 1917, an extensive article on the application of electricity and steam generation in the great Inspiration Copper Company's plant in Arizona will appear. New economic factors have here been developed and this article is not only of intense interest but of great practical importance to men of the industry in the great mining communities of the West.

Conclusions on heat insulating materials will also appear in the issue of August 15, 1917. This subject is one of immense interest throughout the West, due to the growing use of electricity in the heating of water and Mr. Crawford, the author of this series, speaks from the experience of an expert in the heat insulating lines.

Other new ideas are in the planning to make the Journal of Electricity speak to the men of the electrical industry of a great nation through the engineers of the West, who are from all quarters assisting in this great work.

PERSONALS

Fred L. Webster, manager of the California offices of the Allis-Chalmers Company, has left for the East, where he is to have charge of the main office of his company, which is located at Chicago. This promotion comes as a beautiful recognition of the long and effective work of Mr. Webster throughout the West.



As a pioneer in sawmill electrification, he fought many valiant battles for the advance of the electrical industry, and today has to his credit a record of thirty sawmills that he has brought to the method of operation electrical.

In addition to this brilliant achievement there must be given to Mr. Webster the credit of the introduction of the steam turbine as a prime mover in sawmills on the Pacific Coast; the sale of a 2500 kw. motor-generator set to the Pacific Gas & Electric Company, the sale of 4250 k.v.a., 130,000 volt transformers to the Pacific Gas & Electric Company Drum development; 150,000 volt transformers to the Southern Sierras Power Company, 22-800 h.p. Corliss engines for the General Pipe Line and the Valley Pipe Line; the motor installation to drive California Street Cable Railroad; the introduction of the Diesel engine to operate oil pumping machinery through Sanderson & Porter for the Yarhola Pipe Line Company of which he installed 15 complete units of each. He also placed the sale of the hydraulic development in connection with the Pacific Light & Power Company and the Pacific Gas & Electric Company.

Detail notation of Mr. Webster's biography are as follows: Born: Yarmouth, Nova Scotia, 1869. Training: Burrell Johnson Iron Works machinist apprentice, 1886-1890. Engineering experience since completion of training: Williams Engine Works, Beloit, Wis., assistant foreman of machine shop in charge of all erecting and assembling engines 1890 to 1892; E. P. Allis, Milwaukee, erecting power plants 1892-1896; Consolidated Goldfields Company, Johannesburg, South Africa, construction work in connection with the Simmer & Jack Gold Mining Company, and other mines, 1896-1901; St. Louis Transit Company, assistant superintendent of power in charge of all power plants, machine shops and equipment, 1901-1904; Fulton Iron Works, St. Louis, Mo., manager of sales Chicago office, 1904-1906; Allis-Chalmers Manufacturing Company, salesman Chicago office 1906-1907; manager Seattle and Portland offices, 1907-1912; manager California offices, 1912-1917.

Mr. Webster is a member of the American Society of Mechanical Engineers. The heartiest good wishes of engineers and men of the electrical industry throughout the West go with him in his new field of endeavor.

Paul Lebenbaum, electrical engineer for the Portland division of the Southern Pacific Company is a recent San Francisco visitor.

J. A. Groninger, assistant chief electrician of the Santa Fe, with headquarters at San Bernardino, Cal., is a recent San Francisco visitor.

A. C. Cornell, formerly of the St. Louis sales organization of the Western Electric Company, has been made sales manager of the Denver office of the company.

George Scarf, a consulting engineer of Nevada City, and formerly superintendent of the Nevada district of the Pacific Gas & Electric Company, is a San Francisco visitor.

J. A. Cranston, district manager, General Electric Company, for Oregon and Washington with headquarters at Portland, spent three days in Seattle recently on company business.

H. R. Noack, in charge of the hardware and insulator department of the Pacific States Electric Company, has returned to San Francisco after an extended trip through the Northwest.

W. D. Donan has succeeded C. A. Malone as purchasing agent of the California-Oregon Power Company, Mr. Malone having answered the call to service as a captain in the coast artillery.

H. K. Fish, formerly associated with the Western Electric Company at Los Angeles, has recently assumed charge of the electrical department, San Francisco office, Fairbanks, Morse & Company.

Robert E. Rae, for many years with the Western Electric Company and for the last four years sales manager for Stanley & Patterson of New York City, has resigned from the latter concern.

Charles A. Rolfe, president of the Southwestern Home Telephone Company of Redlands, is in San Francisco representing the interests of his company before a hearing of the Railroad Commission.

Paul C. Van Zandt, cement expert of the Allis-Chalmers Manufacturing Company, arrived from Japan on the "Shinyo Maru" after a successful business trip. He was met in San Francisco by Mrs. Van Zandt and son.

F. S. Schuyler, of the San Francisco office of Allis-Chalmers Company, has been left temporarily in charge of the office since Mr. Webster's promotion to the Chicago office until his permanent successor has been appointed.

Samuel A. Chase, assistant to the manager of the supply department of the Westinghouse Electric & Manufacturing Company of East Pittsburgh, is visiting all coast points and making many friends among men of the electrical industry.

H. A. Cleary, assistant city engineer of San Francisco, and A. E. Chandler, of the California Water Commission, recently returned from a tour of inspection of the work of the city of San Francisco now under way upon the Hetch Hetchy project.

H. A. Lemmon, of the Truckee River General Electric Company at Reno, Nevada, after a brief visit at San Francisco and Santa Cruz where he delivered one of the most helpful papers at the recent convention of the California Electrical Contractors' Association has returned again to his home city.

Walter S. Van Winkle, formerly with the Great Western Power Company, is now manager of the Bay Point Light & Power Company of Bay Point and purchasing agent for the Pacific Electro Metals Company, which is installing two 3000 kw. furnaces and three 300 kw. furnaces at Bay Point for the manufacture of ferro-silicon products.

P. F. Apfel, president of the Electric Sales Corporation at Seattle, recently returned from a business trip covering the greater portion of the State of Idaho and while away secured a contract from the school board at Paul, Idaho, for installation of Apfel's system of electric heating in the new high school at approximately three thousand dollars.

Henry G. Bradlee, member of the firm of Stone & Webster and Frederick S. Pratt, chairman of the board of directors, arrived recently in Seattle from Boston. This is the first trip of Mr. Bradlee for more than five years, while Mr. Pratt has returned for an inspection of the Stone & Webster properties in the northwest after an absence of six months.

M. M. O'Shaughnessy, city engineer of San Francisco, was the recipient of a host of congratulations on July 14 by the citizens of San Francisco when the beautiful new four million dollar Twin Peaks tunnel was thrown open to the public for

the first time. The unusual construction features of this work were described in the Journal of Electricity, June 15, 1917.

Percy H. Pitts, industrial engineer for the Pacific Gas & Electric Company, after motoring with his wife to the Santa Cruz convention of the California Electrical Contractors' Association, returned to his home in Oakland just long enough to get a few hours' rest before starting on a two weeks' vacation trip by automobile to the Big Meadows Dam of the Great Western Power Company.

H. R. Judah, assistant general passenger agent of the Southern Pacific Company at San Francisco, has retired from active service after forty-five years of telling effort. Mr. Judah's inherent courtesy and tact have long been recognized by the engineering fraternity of the West and they wish him the joy and peace befitting the contemplation of a life of service for the public well done.

George H. Harries, for years prominent as a public utility

executive, has received a leave of absence from the various corporations with which he is connected in order to resume military service. He is now in command of the Nebraska National Guard, at Fort Crook, having been commissioned brigadier general. General Harries since 1912 has been a vice-president of H. M. Byllesby & Company.

R. L. Cardiff, local manager at Santa Cruz for the Coast Counties Gas & Electric Company, was host at a delightful box party at the Casino after the banquet of the California Electrical Contractors' Association. Among his guests were **Tracy Bibbins**, president Pacific States Electric Company; **R. M. Alvord**, manager supply department General Electric Company's San Francisco office; **D. E. Harris**, vice-president Pacific States Electric Company; **Frank Fagan**, Western manager lamp department, General Electric Company; **Stanley Walton**, commercial department Pacific Gas & Electric Company; **F. H. Thrall**, of Roberts Manufacturing Company, and **Robert Sibley**, editor Journal of Electricity.

MEETING NOTICES FOR ELECTRICAL MEN

Activities Pacific Coast Section N. E. L. A.

Plans are being perfected for a special car of central station men, manufacturers, jobbers and dealers in California, Nevada, Arizona and New Mexico who will attend the convention of the N. W. Electric Light & Power Association at Spokane, Wash., Sept. 12-15. Any electrical man contemplating a trip through the Northwest at this time will be welcome. The car will go directly to the convention by a route yet to be determined. The return trip can be made as desired, stop over privileges being provided on the fare-and-a-third plan. Further information can be obtained from the Secretary Pacific Coast Section N. E. L. A., Mission street, San Francisco.

All members of the Pacific Coast Section N. E. L. A. who are in the service of any branch of the army or navy, or who are engaged in civilian work for any branch of the government due to the war, are requested to notify the secretary of the association promptly in order that a complete record may be kept of the services rendered to the government by the Section membership.

A complete roster of members and committees of the section will be published and distributed in the near future. The appointment of the following committees has already been announced by President H. F. Jackson:

Membership Committee

W. L. McKinley, Chairman, Sierra & S. F. Power Co., S. F.
H. S. Batchelder, Western States Gas & Elec. Co., Stockton.
R. E. Frickey, Northern Cal. Power Co., Redding.
W. S. Leffler, Great Western Power Company, San Francisco.
W. H. Talbot, San Diego Gas & Electric Co., San Diego.
H. N. Sessions, So. Cal. Edison Co., Los Angeles.
H. P. Pitts, Pacific Gas & Elec. Co., San Francisco.
C. F. Butte, Butte Engineering & Elec. Co., San Francisco.
J. M. Buswell, San Joaquin Light & Power Co., Fresno.
C. A. Kelley, Southern Sierras Power Co., Riverside.
Edward C. Russell, Tucson Gas, Elec. Lt. & P. Co., Tucson, Ariz.
J. B. Mechling, Nevada-Cal. Power Co., Goldfield, Nev.
C. E. Hall, Illinois Electric Co., Los Angeles.
J. R. Buchanan, Silver City Power Co., Silver City, N. M.
E. F. Sells, Albuquerque Elec. Lt. & P. Co., Albuquerque, N. M.
Paul V. Quick, Landers, Frary & Clark, San Francisco.
E. G. McBride, Elko-Lamoille Power Co., Elko, Nev.
R. S. Arthur, Douglas Trac. & Light Co., Douglas, Ariz.
J. C. Rendler, So. Cal. Electric Co., Los Angeles.
J. E. Cornell, The Arizona Power Co., Prescott, Ariz.
A. E. Youngholm, Elec. Ry. & Mfrs. Supply Co., San Francisco.
H. E. Sanderson, Bryant Electric Co., San Francisco.
A. B. Day, Los Angeles Gas & Elec. Co., Los Angeles.
J. O. Case, General Electric Co., Los Angeles.
Robert Sibley, Journal of Electricity, San Francisco.

Commercial Committee

S. V. Walton, Chairman, Pacific Gas & Elec. Co., San Francisco.
J. B. Black, Great Western Power Co., San Francisco.
H. A. Lemmon, Truckee River General Electric Co., Reno, Nev.

E. B. Walthall, San Joaquin, Lt. & Power Corp., Fresno.
E. B. Criddle, Southern Sierras Power Co., Riverside.
G. B. McLean, Southern California Edison Co., Los Angeles.
A. E. Holloway, San Diego, Cons. Gas & Elec. Co., San Diego.
C. M. Einhart, Roswell Gas & Elec. Co., Roswell, N. M.
R. M. Alvord, General Electric Co., San Francisco.
Miles L. Steel, Benjamin Electric Mfg. Co., San Francisco.
W. S. Berry, Western Electric Co., San Francisco.
M. L. Scobey, Home Electrical, San Francisco.
H. L. Aller, Pacific Gas & Electric Co., Phoenix.
H. J. Kister, Los Angeles Gas & Electric Co., Los Angeles.

Engineering Committee

J. E. Woodbridge, Chairman, Sierra & S. F. Pr. Co., San Francisco.
J. P. Jollyman, Pacific Gas & Electric Co., San Francisco.
J. A. Koontz, Great Western Power Co., San Francisco.
J. A. Shepard, Deming Ice & Electric Co., Deming, N. M.
J. G. Scragham, Elko-Lamoille Power Co., Elko, Nev.
E. A. Quinn, San Joaquin Light & Power Corp., Fresno.
H. A. Barre, Southern Cal. Edison Co., Los Angeles.
L. M. Klauber, San Diego Cons. Gas & Elec. Co., San Diego.
C. O. Poole, Southern Sierras Power Co., Riverside.
W. C. Hornberger, Pacific Gas & Elec. Co., Phoenix.
S. J. Lisberger, Pacific Gas & Electric Co., San Francisco.
E. R. Cunningham, Southern California Edison Co., Los Angeles.
E. R. Northmore, Los Angeles Gas & Electric Co., Los Angeles.

American Electro-Chemical Society Meeting

The thirty-second general meeting of the American Electro-Chemical Society will be held in Pittsburgh October 3d to 6th. A special feature of the meeting will be a series of papers and discussions on Electro-Chemical War Supplies, and the part the electro-chemical industry will play in the present struggle.

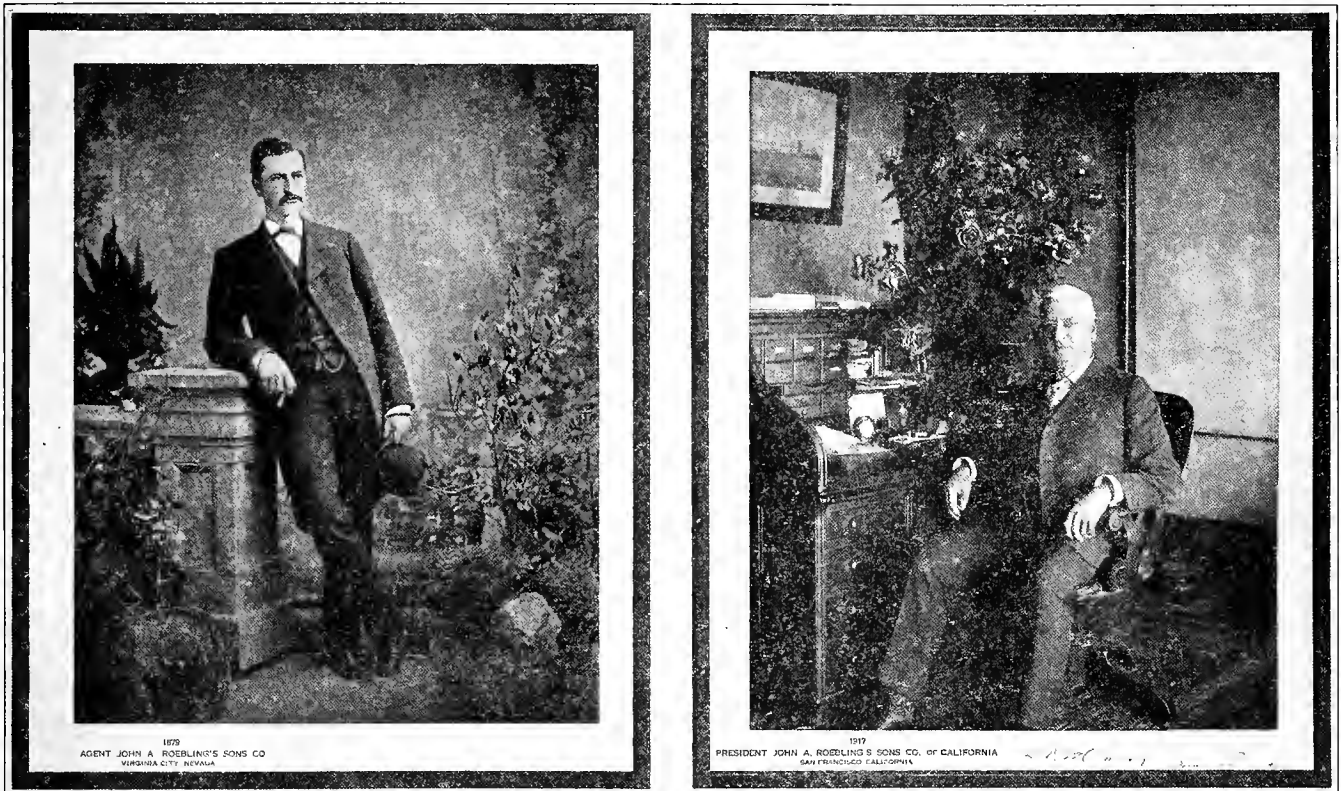
The committee in charge is outlining an elaborate plan of technical sessions, visits to industrial plants, and entertainment features. It invites the delegates to arrive in Pittsburgh on Wednesday, October 2d, so as to get together informally and enjoy some recreations which have been planned for them.

American Association of Engineers

For nearly two years the American Association of Engineers has tested the rendering of service to technical engineers through The Service Clearing House. This department was established solely to place technical engineers in touch with employers. A record of qualifications is maintained through which employers may be introduced to men who in their opinion, possess desirable qualifications. The average number of men placed in touch with vacancies has approximated 100 per month during the past two years. For this service, not one cent commission was charged, the membership dues defrayed all expenses. The association now proposes to broaden the scope of activity by offering to the business men and men in public office services of placing them in touch with competent consulting engineers to carry out any work of an engineering nature. Frequently municipalities desire engineering information, but they are at loss where to get in touch with consulting engineers in whom they may have full confidence.

A TRIBUTE TO A PIONEER ENGINEER

Squire V. Mooney, president John A. Roebling's Sons Co. of California, was recently given a pleasant surprise by many of his business associates on the occasion of his sixty-ninth birthday. Flowers, telegrams of congratulations and personal good wishes for the future were the means adopted to express the kindly feelings of his host of friends. As this year also commences the fortieth year of his services with the company, the two accompanying pictures, one when he assumed his duties as sole western agent in 1879, the other taken at his desk on his natal day, are of particular interest. Coming to California across Central America in 1863, Mr. Mooney was soon attracted to Nevada where his native ability shortly made him assistant superintendent of the famous Comstock mine. With the closing of that producer in 1878



S. V. MOONEY, PRESIDENT JOHN A. ROEBLING'S SONS CO. OF CALIFORNIA

he became agent for John A. Roebling's Sons Co. at Virginia City. Since that time he has been continually with this company, of whose California corporation he is now president. In this period he has been closely associated with the construction of many of the great engineering developments of the West. He is one of the pioneers to whom the younger generation do honor, as the type of men who have helped to build the new West.

This age of progress too seldom pauses to think of those brave spirits who laid the foundation upon which the present superstructure has been reared. The pioneer, literally "one who serves," has ever gone before to prepare the way for others. He is the forerunner of progress, for whose highways his footsteps were the first surveys. He dared the deserts and made them blossom with the rose, he surmounted the mountains, and wrested from them their treasures of metal, he swam the streams and harnessed their turbulence. He is the courier of civilization, overriding precedent and ridding of the impossible by doing it. He plays the game at the outposts of empire and enjoys the playing, slave of the wanderlust but master of nature dust. He is the ambassador of evolution, the leader in science and industry and the benefactor of his race. Onward and upward is his course, ever willing to lend a hand, to start the new and mend the old. His deeds honor his name even if men do not.

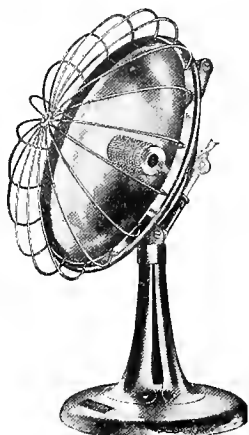
The sentiment that recalls our obligations to these men is of the highest order. What a pleasure it is to pay this well-deserved tribute while the subject is with us, as executive head of the organization he has builded!

LATEST IN EVERYTHING ELECTRICAL

(A new type of radiant heater, a recent improvement in reverse current devices, and an advance in elevator control constitute the briefs on latest in everything electrical that we wish to call to the attention of our readers in this issue. There will also be found in this department an extensive review of new bulletins that should be carefully perused as from it may be gleaned the very latest and best ideas in new apparatus and devices that will greatly advance the electrical industry in the coming season. —The Editor.)

A NEW TYPE OF HEATER

The new type of Hotpoint Radiant Heater, just perfected, is substantially constructed of pressed steel on the principal



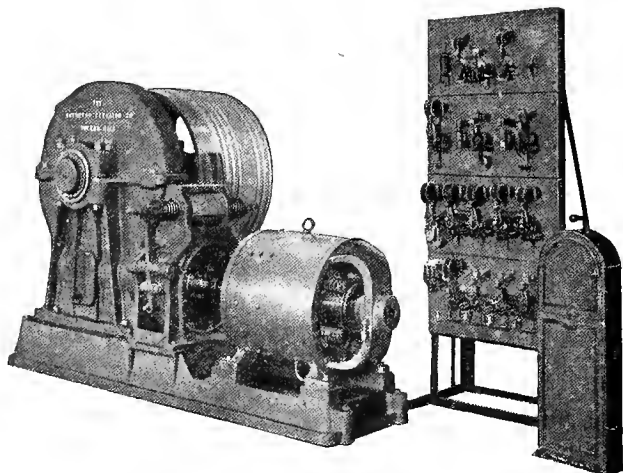
The New Radiator for Baths and Offices

of a portable lamp and is of very attractive design. The reflector has a triple coat of copper plating very highly polished, the back being finished in black enamel, the base and upright in highly polished nickel. The reflector is fastened to the upright by a hinge joint and is adjustable, permitting the heat rays to be directed parallel to the floor or diagonally upward.

The heating element core is made of composition material, the resistance wire being first wound into a small coil about the size of the Radiant Grill coil and then wound around the core one inch in diameter, thus giving a large amount of resistance material in a small space. The coil will run at normal temperature of about 1200 degrees which insures long life and satisfactory service. This particular pattern is especially adapted for small rooms, bath rooms, nurseries and offices during chilly mornings and evenings of fall and spring before cold weather installations are in operation.

NEW ELEVATOR CONTROL EQUIPMENT

The controller, elevator machine and motor for one of the two electric elevators recently installed in the new Willys-Overland Service Station, Tenth avenue and Fifty-seventh street, New York City, are shown in the accom-



Improved Elevator Control

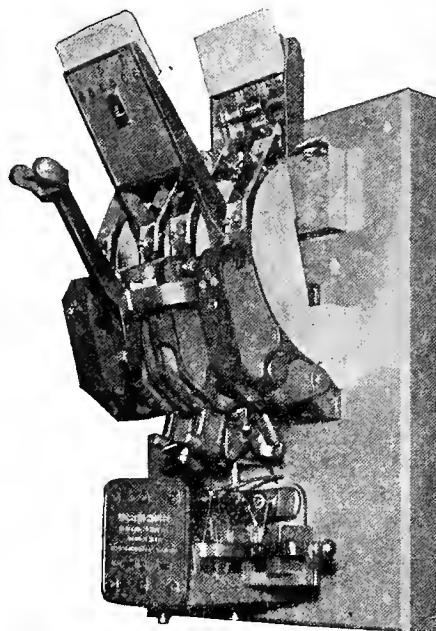
panying illustration. The elevators are of the moderately high speed (400 ft. per min.) passenger type while the machine is of the single gear "V" groove traction construction. The elevator machines and equipment were built and erected

by the Haughton Elevator and Machine Company of Toledo and the controllers designed and made by the Cutler-Hammer Manufacturing Company of Milwaukee.

The magnetic three-speed elevator controllers used in the installation govern the reversal and speed control of the motors. They permit no more current to the motor than is necessary to hoist the maximum load, thus protecting the motor against injury due to excessive currents. The car in its travel is always under the full control of the operator. When it approaches the top and bottom limits, however, it is automatically slowed down and smoothly brought to rest.

CARBON CIRCUIT-BREAKERS

The new reverse current devices on the hand operated breakers of the Westinghouse design are of the polarized mechanical relay type which has proven more accurate and reliable than the solenoid type. As there is no necessity for



A New Carbon Circuit Breaker

electrical contact, these reverse current devices are considered preferable to the separate form of electrical relay operating through shunt coils.

CIVIL SERVICE EXAMINATION

The United States Civil Service Commission announces open competitive examinations for master gage expert, gage inspector, and assistant gage inspector, for men only. Vacancies in the Bureau of Standards, Department of Commerce, for duty in Washington, D. C., and in the field, and in positions requiring similar qualifications, will be filled from these examinations.

The compensation for these positions are as follows: Master Gage Expert, \$2000-\$3500 a year; Gage Inspector, \$1800-\$2400 a year; Assistant Gage Inspector, \$1000-\$1600 a year.

REVIEW OF RECENT BULLETINS

Electric Lighting

The engineering department of the National Lamp Works of the General Electric Company has just issued a helpful booklet on store lighting which contains a discussion of various types of lighting systems with suggestions and tables of particular application in store lighting problems.

The Gardner Electric Manufacturing Company, represented by the Bay Point Electrical Supply Company of Bay Point, Cal., have issued a circular describing the Gardner remote control switch, a simple device for the operation of small street lighting systems, interior lights and small motors.

The engineering department of the National Lamp Works of the General Electric Company has just issued bulletin 28 which deals with show-window lighting, presenting in a general way the essentials of good show-window lighting, emphasizing especially the possibilities of light, direction and color.

Electrical Apparatus and Specialties

The Sprague Electric Works of the General Electric Company has issued bulletin 48923 on electric hoists of from one to six tons, Type W.

A large gear shift folder has recently been issued by The Cutler-Hammer Manufacturing Company entitled "What the Motor Car Distributors Are Doing."

Transmission line insulators for all voltages are discussed at length in a beautiful new illustrated one hundred and six page catalog by The R. Thomas & Sons Company.

Solenoid brakes for a.c. and d.c. motors, and self starters for single-phase induction motors are treated in leaflets of the General Electric Company, Nos. 68010 and 68403 respectively.

The General Electric Company has just issued a bulletin 48900 on "CR-9510 Automatic Solenoid Brakes and CR-9500 Solenoids." Some very interesting data is contained in this thirty-two page bulletin.

"The High Tension Disc Insulator" has recently been published by the Jeffery-Dewitt Company of Detroit, Mich. Power men interested in high tension insulators will find much of interest in reading its contents.

The General Electric Company has just issued a bulletin 46029 on "High Capacity Portable Wattmeter." This instrument as described in the bulletin, is of the dynamometer type, and is very similar in design to the standard type P-3 wattmeters.

"Benjamin Trouble Savers" is the subject of a folder being supplied to central stations for their imprint and distribution by the Benjamin Electric Manufacturing Company. It graphically illustrates the use of Benjamin attachment plugs, two-way plugs and current taps in the home and office.

"Electrical Specialties" is the title of a beautifully illustrated, one hundred twenty-five page catalogue just issued by Harvey Hubbell, Inc., of Bridgeport, Conn. A unique feature that will be of unusual interest to the trade is the chart method made use of in dealing with lamp sockets and other electrical specialties.

Bulletin 44424 has just been issued by the General Electric Company on "GE-203-P Ventilated Commutating Pole Railway Motor." The GE-203-P railway motor is an improved form of the GE-203 motor which has earned a high reputation for satisfactory operation, and of which there are now several thousands in use.

Bulletin 46028, describing the "Temperature Indicator," is being distributed by the General Electric Company. The Temperature Indicator equipment, as explained, affords a convenient and rapid means of indicating continuously, at the switchboard, the temperature of various portions of the windings of electrical machinery under operating conditions.

The General Electric Company is distributing supplementary sheets for bulletin 47100 on safety first, truck type, alternating current switchboard panel units; bulletin 47474 on Type F Form K 21 oil circuit breakers; bulletin 47475 on Type F Form K 26 oil circuit breakers; bulletin 47476 on Type F Form K 22 oil circuit breakers for outdoor service; and Type F Form K 026 oil circuit breakers for outdoor service.

"Westinghouse Electrical Equipment for Ventilating Service" is the title of an unusually attractive, profusely illustrated pamphlet just issued by the Westinghouse Electric & Manufacturing Company (Motor Application Circular 7193). The question of ventilating equipment for various buildings is briefly described in a non-technical manner, and the characteristics of both the alternating and direct current motors for this service are, given in some detail.

Electric Ranges and Appliances

A new folder entitled "A Self Seller" descriptive of the new No. 1 Western Electric iron has made its appearance to the trade.

The revised list of inspected electrical appliances of date April, 1917, prepared by the Underwriters' Laboratories, is now on distribution.

Care and operation of a Hughes Electric Range is the title of a fourteen page booklet just issued by the Hughes Electric Heating Company.

The Hotpoint Electric Heating Company is distributing literature entitled "hotpointers" which will be effective in promoting a bigger than ever heater business in the fall campaign.

"What Every Kitchen Needs" is the title of an interesting and valuable booklet published by the Hughes Electric Heating Company of Chicago. The booklet contains forty-eight pages of electric cooking recipes by Alice Bradley, principal of Miss Farmer's School of Cookery of Boston.

An attractive catalogue on Hotpoint Tableware setting forth percolators, grills, toasters, chafing dishes, teakettles and teapots all electrically operated, has just been issued by the Hotpoint Electric Heating Company. The folio is twenty-four by eighteen inches in size and contains twelve pages of beautifully engraved matter.

A copy of the new catalogue No. 39 of Globe electric ranges and heating devices, is being sent to the trade. This electric range catalogue is compiled with completeness and contains a great fund of information. The illustrations, the descriptions of the various stoves and the little sales talks are quite out of the ordinary.

Up-building of Electrical Industry

Organizing and conducting safety work in mines are effectively treated in technical paper 103 just issued by the Bureau of Mines.

"Water Resources of the State of Oregon" is the subject matter of Bulletin 4 just issued from the office of the State Engineer, Salem, Oregon.

"Important Books on Electricity" is the title of a recent pamphlet of the D. Van Nostrand Company, which sets for the books on the subject either published or imported by that publishing house.

The Jovian Central Office has issued for free distribution a comprehensive brochure completely covering every phase of the accident and health insurance the order is now furnishing its members. The booklet is written by Mercury Eli C. Bennett, and is entitled "Smack—in the Bull's-Eye."

The Society for Electrical Development, Inc., has just issued "House Wiring Publicity Helps" which is a most attractive pamphlet of twenty-eight pages replete with hints and illustrative aids for the house wiring campaign that is now receiving nation-wide attention.

Two new publications by the National Electric Light Association are interesting and helpful. "Electricity in Your Home," aids in securing new business from homes as yet not wired, and "The Comforts and Conveniences of Electricity in Your Home," when placed in the hands of home builders, architects, building constructors, electrical contractors, etc., materially assists in providing adequate electrical equipment at the time the home is built.

Mechanical Apparatus

"Blystone" is the title of a thirty-six page pamphlet on concrete mixers just published by the Bystone Manufacturing Company of Cambridge Springs, Penn.

Scientific Advance

Motor gasoline, its properties, laboratory methods of testing, and practical specifications is the matter dealt with in technical paper 166 of the Bureau of Mines.

The Abstract of the Census of Manufactures has just been issued by the Bureau of the Census. This inquiry, which related to the calendar year 1914, was made in 1915, and the primary or fundamental data derived from it, together with some details as to kinds and quantities of the various classes of products, were issued some time ago in the form of several series of press summaries which were published, in whole or in part, in many newspapers and periodicals. The abstract presents, in convenient form, with an alphabetical index, all the information that will be needed by the great majority of persons who have use for the manufactures statistics.

Miscellaneous

The Southern Pacific Company has issued an interesting booklet entitled "Outing Resorts" that should find a welcome place by all seeking vacation outing in California.

The General Electric Company has just issued leaflets on the individual vehicle taper charging set with automatic panel, the Tungse rectifier, and small battery charging outfits.

The city of Seattle has issued a one hundred sixteen page booklet of specifications for a complete hydroelectric plant in the description of the proposed extension to the municipal electric light and power system of that city.

UTILITY COMMISSION NOTES

California Commission Notes

The California Railroad Commission recently determined to institute an investigation into the rates, rules and regulations of the jitney and auto truck lines subject to its jurisdiction.

It is the purpose of the commission at these hearings to secure information and suggestions from the auto bus men and all interested parties, upon which the commission may formulate rules for the operation of these carriers. These rules, when established, will cover such matters as quality of service, time schedules, filing of bonds, etc. In order that all parties may be represented, the commission has sent notices to all jitney and auto truck operators subject to its jurisdiction, and to all railroads, boards of supervisors and city councils.

Utilities Commission of Idaho

In the matter of the application of the Idaho Power Company for a certificate of convenience and necessity relative to the village of Kimberly, Twin Falls County, Idaho, the commission has granted the request.

In the matter of the application of the Idaho Power Company for a certificate of convenience and necessity relative to the village of Hollister, Twin Falls County, Idaho, it is ordered that the certificate be granted.

In the matter of A. P. McRae, John F. Murphy, J. B. Cox, county commissioners of the County of Shoshone, State of Idaho, and Tamarack and Custer Consolidated Mining

Company, a corporation, complainants, versus The Washington Water Power Company, a corporation, defendant, the action has been dismissed.

In the matter of the application of C. N. Friday for a certificate of public convenience and necessity to construct, maintain and operate an electric light and power system for the village of Dubois, and the communities known as Spencer, Idaho, in the County of Fremont, and Camas, Idaho, in the County of Jefferson, State of Idaho, the commission has granted the request.

ALUMINUM LIGHTNING ARRESTERS

A twenty-four page bulletin No. 45601-A is being distributed by the General Electric Company on "Aluminum Lightning Arresters for Alternating Current Circuits." This bulletin supersedes Bulletin No. 45601, and contains valuable data and diagrams on this installation.

The General Electric Company claims that the aluminum type of lightning arrester is superior in protective qualities to any other. It owes these qualities chiefly to the "Valve" action of the aluminum cell which has the property of opposing the flow of current, like a high resistance, at the normal operating voltage, and of allowing a free flow at abnormal voltages due to lightning or similar disturbances. A close analogy to this action is found in the safety valve of the steam boiler, by which steam is confined until the pressure rises above a certain value, when it is released.

HEADLIGHTS AND TURBO-GENERATORS FOR STEAM LOCOMOTIVES

The General Electric Company has just prepared for distribution, bulletin No. 42,014 entitled "Headlights and Turbo-Generators for Steam Locomotives." To meet the rigid requirements of locomotive headlight service, the General Electric Company has designed a turbo-generator set distinctly novel in its construction and representing the most advanced development in this class of apparatus along practical lines. Three years of exhaustive service tests and a knowledge accumulated from a vast amount of experience in turbine manufacture have resulted in the building of these turbines with the smallest number of parts consistent with the requirements of good design, durability, efficiency and close regulation.

The headlight supplied with the turbo-generator consists of an 18-inch silver plated, copper reflector, equipped with a simple focusing device mounted on a suitable table and enclosed in a steel casing of standard design. The reflector has a 2¼ inch focal length which is sufficiently long for accurate focusing of the largest headlight lamps.

BOOK REVIEWS

The Nelson Form for Choosing Bidders and Awarding Contracts. By H. W. Nelson of Moline, Illinois, and for sale at Technical Book Shop, San Francisco. Size 4 by 5 in.; 84 pp.; paper binding. Price 50c.

The author of this booklet is president of Moline Heat Co. of Moline, Illinois, and has for over twenty years been closely allied with electrical contracting. Twelve years' experience in the engineering profession has carried him to almost every part of this country.

The booklet contains a working plan for properly filling out bids and offers a method of procedure. At the Santa Cruz convention of the California Electrical Contractors Association, July 11-14, 1917, W. S. Berry, Western salesmanager of the Western Electric Company, highly recommended its use among electrical contractors and told of its helpful application in a number of Eastern centers.

TRADE NOTES

Eastern Announcements of Office and Management

The Smith Perry Electric Company of Dallas, Texas, is announced as distributor throughout Texas and Oklahoma for electric ranges and heating devices manufactured by the Globe Stove & Range Company of Kokomo, Indiana.

The Wagner Electric Manufacturing Company, of St. Louis, announces the appointment of F. T. Coup, formerly connected with its Chicago office, to take charge of its Milwaukee office, in its new location, the First National Bank Building.

Announcement has just been made by the Westinghouse Electric & Manufacturing Company that it has been awarded the contract for furnishing the electrical equipment for the new Pennsylvania hotel now being erected at Seventh avenue and Thirty-third street, New York City.

New Business—Seattle, District

Sanderson & Porter, engineers, New York, have made final arrangements for their shipyard at Raymond, Washington.

The Classen Chemical Company of Port Hadlock, Washington, are making improvements and increasing their facilities for the manufacture of sulphurous acid.

The De Laval Steam Turbine Company, William T. Pulten, manager, formerly of the Geo. B. Adair Company, have opened their new offices in the L. C. Smith building, Seattle.

The Washington Pulp & Paper Company, Port Angeles, Washington, are rapidly making headway on their new paper and pulp mills located on Ediz Hook at Port Angeles, Washington.

The Wheeler-Osgood Company, Tacoma, have just completed their new 150 ft. by 8 ft. Alphons Custodis Chimney Construction Company radial brick stack for their new power house at their Tacoma mills.

The Olympia Light & Power Company, L. B. Faulkner, manager, expect to have their new 2000 horsepower high tension substation at Tumwater Falls in operation shortly, power being supplied from the transmission system of the Stone & Webster lines from Tacoma.

The American District Telegraph Company, installers and operators of central station fire alarms, supervisory watchman service, supervisory sprinkler alarms and burglar alarms, have been endeavoring to secure a franchise from the Seattle council to operate in the city of Seattle.

The Hallidie Machinery Company, Seattle, R. E. Lunkley, manager, Northwestern agents for the Ridgeway Dynamo & Engine Company, are furnishing a 1250 k.v.a. Ridgeway-Rateau steam turbine and alternator unit for the new power plant of the Wheeler-Osgood Company, Tacoma, Washington.

The Wheeler-Osgood Company of Tacoma is to equip its mill with electrical machinery which will increase its capacity from 150,000 to 170,000 feet per day. Four 465-horsepower turbines, three boilers, one generator and one turbine will be purchased at once. The improvements at the mill will cost a total of \$60,000.

The old blast furnace and smelter plant of the Oregon Iron & Steel Company, occupying five acres of land along the Willamette River at Oswego, were purchased outright recently by William Pigott of Seattle, head of the Pacific Coast Steel Company interests in this section, with the prospect that it will be placed in shape within about 60 days for the manufacture of pig iron.

Puget Sound Sawmills & Shingle Company recently placed in operation its mill at South Bellingham. The mill has been practically rebuilt and will be electrically driven. A 1250 k.v.a. Allis-Chalmers steam turbine unit and 50 motors made by the same company were installed. The plant is now

in operation and the results obtained from the new equipment are very satisfactory.

Gray & Barash Company, Incorporated, First avenue South and Jackson street, Seattle, electrical engineers and contractors, have leased a site comprising a block at Horton avenue and Colorado street in the South canal waterway addition and will erect a plant covering the entire block. Extensive orders for electrical machinery and equipment for the numerous ships under construction and proposed has led to the taking of this step in order to better handle the business.

The Standard Electric Company, 316 First avenue South, Seattle, organized the latter part of 1916 by Herbert C. Moss, has been very active since its organization. It will shortly start work on the electrification of the Spokane avenue bridge for the city; is building a \$3000 switchboard for the naval torpedo station at Keyport near Bremerton and is installing the entire electrical equipment for the plant of the National Engineering Company under construction at South Park, Seattle.

NePage, McKenny Company, with headquarters at Seattle and with offices in the chief Pacific coast cities, report business active. A contract was recently closed for the complete electrical equipment in the Oregon-Washington dock, Seattle. The San Francisco office reports the signing up of a contract for the complete electrical equipment in the women's dormitory building at Stanford University, amounting to about \$25,000; the company has the contract for similar work in the Judson Iron Works at Oakland approximating \$30,000 and is doing work for the Chevrolet Motor Company in Oakland amounting to \$60,000. The Portland office reports important contracts for electrical work in new ships.

New Business—Portland District

Since the \$6,000,000 bonding act for road purposes has carried, the State Highway Department of Oregon has been flooded with applications for positions, not only from points in Oregon, Washington, California and Idaho, but the eastern states as well.

The West Coast Engineering Company and the J. C. English Company, both of Portland, Oregon, were the electrical contractors and the fixture contractors, respectively, for the beautiful new building of the First National Bank of Portland, described under "Banking Institutions Doing-it-Electrically" in the issue of the Journal of Electricity for July 1, 1917.

The Silver Falls Timber Company of Silverton, Oregon, has started its new mill. This is entirely electrically driven, the prime mover being a 1250 k.v.a. horizontal Allis-Chalmers steam turbine. The sawmill and planing mill are equipped throughout with Allis-Chalmers motors. The sawmill machinery was built by the Allis-Chalmers Manufacturing Company.

New Business—Los Angeles District

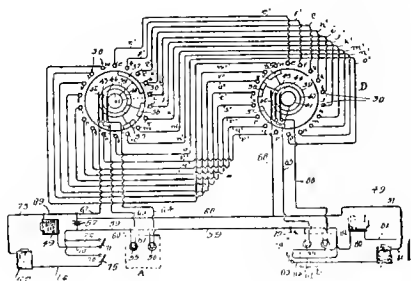
The San Diego Consolidated Gas & Electric Company, which is a prominent subsidiary of Standard Gas & Electric Company, has received authority from the California Railroad Commission to contract with the Southern California Edison Company for a supply of hydroelectric power to supply the total demands on its distributing system and a 100 per cent increase in future business. The contract will be for a period of 20 years and will enable the San Diego Company to practically close down its 16,000 horsepower steam plant, which uses oil for fuel, and hold the steam plant as a reserve. The Southern California Edison Company will build a duplicate transmission line from Santa Ana south to connect with the transmission system of the San Diego Company at San Juan Capistrano.

WHAT WESTERN INVENTORS ARE DOING

(The electric stove has long been recognized as a possible means for profitably marketing huge quantities of electrical energy throughout the West. Below may be found an interesting brief of a new device for an electric stove which has just been patented by the Hotpoint Electric Company at Ontario, California. Four other devices, the inventors of which are men in the West, are also briefed in the following lines. These consist of an elevator signaling system, a ship-building form, a steam whistle signaling device, and an electric signaling device for automobiles.—The Editor.)

1,231,033. Elevator Signaling System. Walter A. Loomis, Los Angeles, Cal.

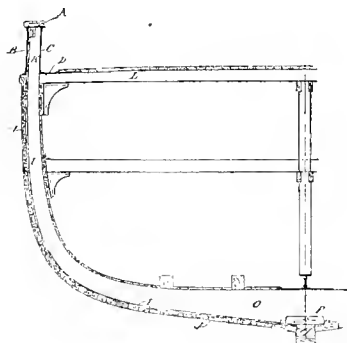
An elevator signaling system, the combination with independently operable elevator cars adapted to run at predetermined relative positions, of electrical signaling means in each car, a normally open circuit for and common to said signaling means, and means to close the circuit for the signaling means of the cars when the latter move out of their predetermined relative positions, comprising a series of correspondingly arranged contacts for each car, rotatable contact members for each series, the corresponding contact



members of said series being connected with one another electrically, said rotatable contacts being normally engaged with non-corresponding contacts of said series, and means for rotating the rotatable contacts synchronously when the cars are running at their predetermined relative positions whereby when one car moves out of its predetermined position relative to the other the rotatable contacts thereof will touch contacts of its series which correspond to the contacts of the other series and the circuit for the signaling means will be closed.

1,231,232. Shipbuilding. Fred A. Ballin, Portland, Ore.

A wooden ship, a metal bulwark plate above the main deck line that forms a member of a top chord of a truss,

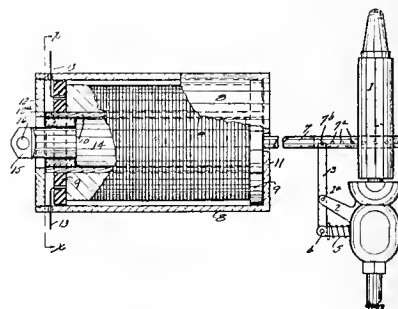


diagonally disposed planking and wooden frame sections that form the sheer members of the truss and means for joining the several parts together with the bulwark plates exposed.

1,231,179. Signaling Device. James P. McBride, Seattle, Wash., assignor to Carl M. Lovsted, Seattle, Wash.

A solenoid operated steam whistle having a valve con-

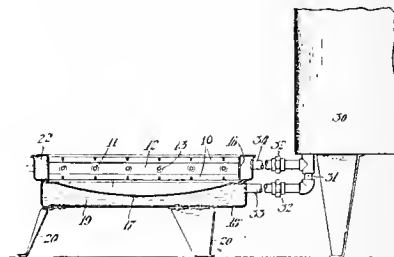
trolling lever, the combination of a perforated extension bar one end of which is integral with the core of the solenoid,



adjustable hole and pin connection means between the bar and the whistle lever, whereby the solenoid and whistle may be adjusted as to relative position.

1,231,196. Radiant-Type Stove. William A. Rankin and Henry D. Laraway, Ontario, Cal., assignors to Hotpoint Electric Heating Company, Ontario, Cal., a corporation of California.

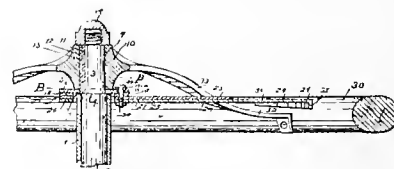
An electric heating device, comprising an electric heating element, a reflector placed near the heating element,



walls forming an inclosed chamber adjacent to said reflector, walls forming an inclosed chamber around the walls of the device, a body of cooling fluid in said chambers, a reservoir, and means for connecting the interior of said chambers with said reservoir.

1,230,957. Electric Signaling Device for Automobiles. George F. Voight, San Francisco, Cal.

A device of the kind described, including a disk-shaped supporting plate mounted upon the upper and reduced end



of the steering wheel shaft and above, the upper end of the standard, an outstanding flexible contact lever supported by the supporting plate,

NEW ELECTRICAL DEVELOPMENTS

(Electro-chemical demands for power in Central California, that bid well to absorb the greatest single load thus far furnished one company in industrial uses, constitute the most important new electrical development of the past semi-monthly period. Reference is made to this new load on the editorial page of this issue. Other items of new electrical development throughout the West may be gleaned from the following lines.—The Editor.)

FINANCIAL

SAN FRANCISCO, CAL.—Receiver John P. Coughlin of the Northern Electric Railway has issued the following statement of earnings for the fiscal year closing June 30, 1917, compared with the same period last year:

	1917	Increase
Gross earnings	\$920,206.00	\$102,772.88
Operating expenses	724,155.88	3,903.48
	\$196,050.12	\$ 98,869.40
Taxes	\$ 44,532.60	784.31
	\$151,517.52	\$ 98,085.09

MESA, ARIZ.—The town council has received two bids for the gas and electric bonds. One through the Mesa City Bank at par, less \$3700 expense; the other through the Salt River Valley Bank at par, less \$3000 expense. The council may readvertise for bids.

SONORA, CAL.—An ordinance was read for the first time for a special election to be held for the purpose of submitting to the qualified electors of Sonora, a proposition to incur a bonded indebtedness to pay the cost of municipal light and power works, consisting of an electrical distributing and street lighting system. It was laid over for second reading.

LOS ANGELES, CAL.—The public service commission has set aside from municipal power revenues for the month of June the sum of \$50,000 to be placed in the city treasury for payment of interest and sinking fund on all issues of power bonds. This makes \$100,000 that has thus been set aside by the commission for this purpose, in compliance with its announced policy of making monthly appropriations for the payment of all interest.

REDDING, CAL.—The Anderson-Cottonwood Irrigation District has sold \$368,000 of 6 per cent bonds to the Anglo-London Paris Bank of San Francisco, at \$96.69 and accrued interest. The same bank paid only \$95.63 for \$480,000 of the same bonds about a year ago. The higher price was realized today because the success of the district is assured. Water was turned into the main canal last Sunday and is as far south as Anderson. The latest sale will give the district all the money it will need for five or six years. It retains \$207,000 of the bonds, which it may sell at any time.

INCORPORATIONS

WAUCONDA, WASH.—The Wauconda Telephone Company has been incorporated here.

WOLF POINT, MONT.—The Wolf Point Motor Company has been incorporated here.

WESTBY, MONT.—The Westby Telephone Company has been incorporated in this place.

GREY CLIFF, MONT.—The Bridger Creek Telephone Company has been incorporated in this city.

LOS ANGELES, CAL.—The Anderson Electric Company of California has been incorporated in this city.

SPOKANE, WASH.—Articles of incorporation have been filed in Olympia for the Northwest Power & Light Company with a capitalization of \$200,000.

SALT LAKE CITY, UTAH.—The Buckle Electric Company has been incorporated in this city by J. V. Buckle, M. M. Allison, Mary E. Freck, Gladys Buckle and J. G. Larson.

AUBURN, CAL.—Articles of incorporation have been filed by J. W. Morgan and Daniel Kirby of Auburn and Dr. J. L. Rollins of Colfax for the incorporation of the Bear River Water & Power Company.

ILLUMINATION

BUTTE, MONT.—The Electrical Equipment Company (Inc.), has succeeded the Sullivan Electric Company.

MARIPOSA, CAL.—The San Joaquin Light & Power Company has been awarded a franchise to operate in this city.

VIRGINIA CITY, NEV.—The Nevada Valleys Power Company has filed an application for a lighting franchise in this city.

LEMOORE, CAL.—The Trustees have rejected all bids for the furnishing and installing of the proposed electrolier system.

WATTS, CAL.—The board of trustees of Watts accepted the bid of D. A. Tamplin at \$2025 for a complete electric lighting system.

FULLERTON, CAL.—La Habra has decided to establish a lighting system. A petition has been submitted to the board of Supervisors.

DALY CITY, CAL.—County Clerk J. H. Nash is receiving bids for illumination with electricity of the public highways in the Visitacion district.

RIVERSIDE, CAL.—The common council of Riverside is receiving bids for an electric lighting system according to plans and specifications on file with the city engineer.

LODI, CAL.—Electroliers will be placed on East Lodi avenue. The committees have secured funds for the installation of the lights. A single globe type of electrolier has been endorsed. The base will be made of concrete.

ALBANY, ORE.—The city council acting as a committee of the whole relative to the matter of the acquisition of a water and electric plant by the city, presented an unfavorable report at a special caucus.

BOISE, IDAHO.—The Idaho Power Company has been given a certificate of public convenience and necessity by the public utilities commission for an electric light system in the town of Kimberly, Twin Falls County.

YUMA, ARIZ.—A franchise has been granted to E. F. Sanguinetti and F. L. Ewing for the erection and maintenance of a line of poles and wires for the transmission of electrical energy for light and power purposes along Gila street.

CORCORAN, CAL.—The San Joaquin Light & Power Corporation has a force of seven men at work installing the system of 29 1000-candle power street lights which are to be distributed throughout the residence and business section of Corcoran.

EVERETT, WASH.—The county commissioners have given the Washington Coast Utilities Company a franchise for constructing electric light and power lines through eight townships in the north end of the county, covering in all about 200 miles of line.

WILLIAMS, ARIZ.—F. A. Jones of Phoenix is conferring with an eastern capitalist who is interested in the Williams Electric Light & Water Company whose plant was burned, and the two will arrive at some plan whereby the

town can have electric lights at once. The loss will be in the neighborhood of \$25,000.

HONOLULU, T. H.—Congress has appropriated the \$80,000 authorized two years ago for lighting the entrance channel to Pearl Harbor. The appropriation is for lighting the entire entrance channel. Between 15 and 20 light stations will be built to replace the present system of light buoys. Next in order will be the drawing up of plans and specifications by Superintendent F. C. Palmer and Inspector Arledge. After these are approved by Washington bids will be advertised for.

TRANSMISSION

LOS ANGELES, CAL.—Sealed bids are being received by the board of public service commission for electric generator, equipment and transformer.

ELLENBURG, WASH.—Heath & Gove, architects of Tacoma are receiving bids for the construction of a new power house at the State Normal School here.

GLENDAL, CAL.—The board of trustees are receiving bids for three-phase electrical current to be furnished the city to be used in operation of its electrical distributing system.

LOS ANGELES, CAL.—The Davidson Construction Company has been awarded the contract for building a power house in the rear of the new Coulter building. The cost will be \$9960.

PORTLAND, ORE.—Bids are now being received by the Western Reduction Company for a transformer and power house building to be built in connection with a new industry to be established here.

RENO, NEV.—The Truckee River General Electric Company is to build a high tension power line from Verdi to the Poeville mining district and it is believed many mines will install electric plants.

MARTINEZ, CAL.—Ground has been broken at Bay Point for the erection of a new manufacturing plant for the manufacture of chemicals by an electrolysis process by the Pacific Electric Metal Company.

HAINES, ORE.—The flood of Rock Creek caused a damage to the Eastern Oregon Light & Power Company's flume and transmission line of approximately \$3000 and it will take \$500 to repair the broken dam at Killamacus Lake.

OROVILLE, CAL.—Development of the St. Francis mine at Klamath Peak upon a large scale is to proceed at once. Plans include the installation of a hydroelectric plant. Waters of the Sucker Run have been taken over by the Engel interests and will be used to develop power to operate the mines.

TACOMA, WASH.—The members of the city council will meet soon to discuss the advisability of purchasing the Hebb power site on the White River for the construction of a power plant for the city at an estimated cost of \$1,000,000. The site is capable of generating 120,000 h.p., four times the capacity of the La Grande plant.

PALO ALTO, CAL.—One hundred thousand dollars is to be expended at Palo Alto by the United States for a 12-mile terminal belt railroad and about \$60,000 for 2,000,000 ft. of lumber. Other needs will be 2,000,000 ft. of insulated wire, 16,000 ft. of lamp cord; 8000 key sockets, 9000 shades, 10,000 cleat receptacles, 8500 snap switches and other electrical equipment.

SAN FRANCISCO, CAL.—George S. De Sousa, traffic manager of the Marconi Wireless Telegraph Company, has transferred his headquarters from New York to this city, where he will be in charge of the entire Pacific Coast division of the Marconi Company. De Sousa arrived here several days ago and has taken charge of the company's traffic in the Insurance Exchange Building.

GRASS VALLEY, CAL.—Messrs. Dibble and Powers have been at Sierra City making arrangements to develop the

Shamrock group of claims belonging to John Mansfield. A small electric plant will be put in at once to furnish power for machinery to drive the tunnel. It is the intention to push all work on the Shamrock, and the operators figure on spending at least \$20,000 for development this summer.

RENO, NEV.—The Nevada Valleys Power Company, operating a plant at Lahontan and now furnishing power for Lovelock, Rochester, Packard and other districts in Humboldt County, is going to extend its lines into Washoe County. The company does not want to extend its lines into Virginia City, but wants permission to run the power line through one corner of Storey County in order to bring it to Washoe County from the Lahontan plant. The company does not intend to compete with the Truckee River General Electric Company, it is understood, but will buy power from it.

TRANSPORTATION

SANTA ANA, CAL.—The people of Tustin have voted to have the Pacific Electric Railway come into Tustin.

FULLERTON, CAL.—The Pacific Electric, instead of building into Fullerton, will start operations from this end before the end of next week.

PETALUMA, CAL.—The Petaluma-Santa Rosa Electric Railroad has awarded a contract to H. P. Vogensen of this city to erect a new depot of Mission design at Sebastopol.

SANTA ANA, CAL.—An ordinance has been adopted by the board of supervisors granting to the Pacific Electric Railway Company a franchise to construct and for 50 years to maintain an electric railroad along certain public roads and highways in the county of Orange.

LONG BEACH, CAL.—The city commissioners have given the Pacific Electric Railway Company permission to lay a single track standard gauge line on Water street, connecting with the main line and serving the Craig Shipbuilding Company and other industrial establishments.

ANTIOCH, CAL.—There is every indication that the Oakland-Antioch electric road will be extended from Pittsburg to Stockton through Antioch within a very few months, judging by the announcement made in the press dispatches that the Western Pacific was negotiating for the purchase of this line and the Northern Electric.

SANTA ANA, CAL.—The Pacific Electric Railroad Company has petitioned the board of supervisors for a five-year franchise from Santa Ana to Tustin, with a spur line to Burges new packing house on Lyon street. The line will be built along what is known as the Sixth street route. From Santa Ana the road will branch off the Huntington Beach line southeast of this city.

ASTORIA, ORE.—The Pacific Power & Light Company has awarded a contract for the reconstruction of a bridge for its car line in upper Astoria. Besides the bridge, the company will extend its terminals in upper Astoria one mile to reach the present city limits. Besides these improvements the Pacific Power & Light Company will spend \$35,000 this year in other work here.

TELEPHONE AND TELEGRAPH

SUNNYSIDE, CAL.—The Sunnyside Telephone Company and the Valley Telephone Company have combined and will be known as the City Telephone Company.

HONOLULU, T. H.—The Mutual Telephone Company has taken out a building permit to erect an exchange in Kalihi on Kali street. The new building is to be constructed of concrete and to cost \$15,000.

HEALDSBURG, CAL.—At a recent meeting of the board of trustees a motion was passed that the city attorney notify the California Light & Telephone Company that it is the intention of this city to advertise for sale a franchise for erecting poles and maintaining lines, etc., for telephone service in this city.

MESA, ARIZ.—District Manager P. C. Gettins and Construction Foreman Rohrig of the Mountain States Telephone Company have completed arrangements for the erection of the new exchange building for the Mesa telephone exchange. The new building will be of the standard type of Bell Telephone Company's exchange building construction, and be located at the corner of Main and Center, and will be of cream colored brick.

LOS ANGELES, CAL.—The Southern California Telephone Company, recently organized, has set aside \$750,000 for connecting and consolidating the Pacific and Home systems in and around Los Angeles. About \$250,000 will be expended for new switchboards, additions to existing switchboards and other apparatus; long distance systems, \$14,000; installing and improving private branches, \$30,000, and the remainder in consolidating the Pacific and Home exchanges at various points.

IRRIGATION

WILLOWS, CAL.—The board of supervisors has fixed Wednesday, August 5, as the date for holding the election on the organization of the Jacinto irrigation district, when it is believed the project will receive many more votes than the required two-thirds.

SAN DIMAS, CAL.—When the State Water Commission authorize the improvement, a group of San Dimas men will begin work on a \$2,000,000 irrigation project, which will irrigate from 8000 to 10,000 acres of level land lying in the triangle formed by Pomona, San Dimas and Walnut.

SACRAMENTO, CAL.—The 8 inch electric pump of the Carmichael Colony Irrigation District has been started, and, with some adjustments, has been running more than a week. An abundance of water will be supplied in the colony. Delay was caused in starting by inability to get material from the manufacturers.

LODI, CAL.—E. M. Elliott and J. M. Posey of the new irrigation district, paid \$6000 to the Stockton-Mokelumne Canal Company as the first payment on the irrigation plant which they expect to use as a nucleus around which they will form a Wright irrigation district. The district will consist of at least 12,000 acres, and possibly 20,000 acres.

MANTECA, CAL.—Roger Olmstead, one of the oldest engineers in point of service in the San Joaquin irrigation district is to be in charge of the construction of the Hilts' Sag flume above Oakdale. The big flume, which will be put up at a total cost between \$150,000 and \$200,000, is to consist of a reinforced concrete trestle 2200 feet in length and 70 feet high. It will support a box 15 feet wide and 10 feet in height.

LINDSAY, CAL.—It is now stated that there is little probability of securing water from the ditches of the Lindsay-Strathmore Irrigation System until about September 1. The company is being handicapped by lack of material and shortage of labor, while difficulty is being encountered at the old Merryman ditch, which is delaying work on the lower level line.

REDDING, CAL.—Water was turned into the main canal of the Anderson-Cottonwood irrigation district for the first time last week. The irrigation system will furnish water for 30,000 acres of land at a cost of less than \$30 an acre. Farmers of the valley below are jubilant, though many of them will not reap the full benefit this season pending the putting in of headgates and opening up of laterals.

MANTECA, CAL.—To expedite the work of construction of the Hilt's sag flume, some steel forms for pouring concrete are to be purchased. The agreement drawn up by the attorneys for the Oakdale and South San Joaquin irrigation districts for the securing of water from the Sierra & San Francisco Power Company have reached the local office and will be taken up by the directors at their next meeting.

CHICO, CAL.—Work on the Paradise irrigation project

is proceeding rapidly. Engineer Goodner has 75 men on the dam. Blasting for the spillway is now being done. Two miles of the main canal, which is being constructed under a separate contract, have been completed. W. H. Kraner, contractor for the distributing system, has a large ditching machine at work and several miles of trench for the pipes have been opened. The directors have asked the supervisors for permission to lay a pipe along the Paradise road, claiming the Wright law gives them this right. The matter is being looked into by District Attorney Leonard.

YUMA, ARIZ.—An application is on file for a franchise to place pipes on Gila and Willow streets for the purpose of running water to the Yuma mesa and irrigating about 17,000 acres of arid land. Also, an application to purchase a tract of land on the banks of the Colorado River north of the old prison cemetery, as a site for the installation of a 3000 h.p. pumping plant is on file. The name of the company which will carry the project through is the Yuma Mesa Irrigation Company. It is provided in the contract that the company will commence building the system not later than January, 1918, and have water ready for delivery not later than January 1, 1921.

BAKERSFIELD, CAL.—That an estimated flood of 1000 second feet of water from Kern River is going to waste in the overflow from Buena Vista Lake channel, beyond Lost Hills, is the report of a committee of citizens, comprising A. W. Thresher, Tipton Matthews, C. H. Brunton and J. F. Farraber, who made an investigation. They reported that a body of water 314 feet wide, and six feet deep, is flowing at the rate of 100 feet a minute, making a surplus of unused water in Kern County that would irrigate 50,000 acres to a depth of a foot in a month. They also estimated that the waste waters from Kern River, as shown by their investigation at the overflow, would irrigate 100,000 acres in addition to the 175,000 acres now under cultivation from Kern River.

AUBURN, CAL.—Articles of incorporation have been filed in the office of the Secretary of State for the organization of the Bear River Water & Light Company. The corporation was formed by members of the Erie Mining Company, who state that they are forming a public service corporation. The new corporation will build on the Bear River at a point on the old mining claim a dam that it is claimed will be nearly twice the size of the Lake Spaulding dam. A power house will be built at the dam. The water passing through the power house will be turned on the land below and used for irrigation purposes. The capital stock consists of 10,000 shares at \$1 a share at par. Each member of the company has subscribed a dollar. The incorporators are J. W. Morgan and Daniel Kirby of Auburn and Dr. J. L. Rollins of Colfax.

BYRON, CAL.—There is a prospect of the early completion of the Byron-Bethany irrigation system, which will irrigate 15,000 acres of land. The project has been retarded owing to the fact that it was controlled by a private company, which could not condemn land for rights of way for the canal but it has been reorganized, and, as a public utility, has the rights of condemnation. The land is fertile, and it will make an important addition to the resources of eastern Contra Costa and western San Joaquin counties. On the Brentwood Irrigated Farms, which were brought under irrigation recently, there have been planted 1000 acres of sugar beets, 1000 acres of beans and 500 acres of alfalfa. This district has been under dry farming, one of the famous wheat sections of California, but from now on will be devoted to intensive culture. The land is being subdivided. Water is pumped from the San Joaquin River, and the whole system will embrace several thousand acres. Prospects are good in this county for a full crop of Bartlett pears, prunes, apples and peaches, 50 per cent crop of apricots and a 75 per cent crop of almonds. Numerous plantings of English walnuts are gradually coming into bearing. The crop promises 100 per cent this year.

ALPHABETICAL INDEX TO ADVERTISERS

The letter and number before each name are used in the classified page preceeding

- | | |
|--|---|
| A-1 American Ever-Ready Works of National Carbon Co
Los Angeles; 755 Folsom St., San Francisco; Seattle. | M-3 Moore & Co., Charles C. 19
Van Nuys Bldg., Los Angeles; Spalding Bldg., Portland;
Kearns Bldg., Salt Lake City; Sheldon Bldg., San Francisco;
Mutual Life Bldg., Seattle; Santa Rita Hotel Bldg., Tucson. |
| A-2 Associated Engineering & Supply Co. 19
San Francisco, 840 Pacific Bldg., Los Angeles, Portland, Vancouver, B. C. | N-1 Nason & Co., R. N.
151 Potrero Ave., San Francisco. |
| B-1 Baker-Joslyn Company. 3
71-75 New Montgomery St., San Francisco; 911 Western Ave., Seattle; 353 Second St., Los Angeles. | N-2 National Conduit & Cable Co., The.
Trust and Savings Bldg., Los Angeles; Rialto Bldg., San Francisco. |
| C-1 Century Electric Co. 16
906 So. Hope St., Los Angeles; 56 Natoma St., San Francisco; 65 Front St., Portland, Ore. | N-3 National Lamp Works of G. E. Co. 14
(All Jobbers.) |
| C-3 Crocker-Wheeler Co.
87 New Montgomery St., San Francisco; 228 Central Avenue, Los Angeles. | N-4 New York Insulated Wire Co. 11
629 Howard St., San Francisco. |
| C-5 Crouse-Hinds Company
Syracuse, N. Y., U. S. A.
New York, Boston, Cincinnati, Chicago. | N-5 Northwestern Pacific
Ferry Bldg., San Francisco. |
| C-4 Cutler-Hammer Manufacturing Co.
579 Howard St., San Francisco; Morgan Bldg., Portland, Ore.; San Fernando Bldg., Los Angeles. | N-6 National Carbon Co.
Cleveland, Ohio. |
| D-1 Detroit Fuse & Manufacturing Co. 4
1404 Rivard Street, Detroit, Mich. | O-1 Okonite Co. (The) 20
(All Jobbers.) |
| E-1 Edison Lamp Works of General Electric Co.
Rialto Bldg., San Francisco; 724 So. Spring St., Los Angeles. | P-2 Pacific States Electric Co. 13
236-240 So. Los Angeles St., Los Angeles; 61-67 Fifth St. No., Portland; 200-210 Twelfth St., Oakland; 575 Mission St., San Francisco; 307 First Ave. So., Seattle. |
| E-2 Edison Storage Battery Supply Co. 15
206-8-10 First St., (near Howard), San Francisco. | P-5 Pierson, Roeding & Co. 12
Pacific Electric Bldg., Los Angeles; Rialto Bldg., San Francisco; Colman Bldg., Seattle. |
| E-3 Electric Agencies Co.
279-283 Minna St., San Francisco; 419-421 E. Third St., Los Angeles. | P-7 Pittsburgh Piping & Equipment Co. 20
Monadnock Bldg., San Francisco. |
| E-4 Electric Storage Battery Co. 11
1536 Bush St., San Francisco. | S-4 Southern Pacific Co. 2
Flood Bldg., San Francisco. |
| E-5 Electric, Railway & Manufacturing Supply Co. 10
34 Second St., San Francisco. | S-5 Sprague Electric Works. 15
Rialto Bldg., San Francisco; Colman Bldg., Seattle; Corporation Bldg., Los Angeles; Electric Bldg., Portland; Paulsen Bldg., Spokane. |
| E-6 Electric Novelty Works.
533 Mission St., San Francisco. | S-6 Standard Underground Cable Co. 15
First National Bank Bldg., San Francisco; Hibernian Bldg., Los Angeles; Central Bldg., Seattle, Wash.; 815 Newhouse Bldg., Salt Lake City, Utah. |
| E-7 Economy Fuse & Mfg. Co.
Kinzie and Orleans Sts., Chicago. | T-1 Thomas & Co., R. 12
Pacific States Electric Co. and Western Electric Co., Pacific Coast Representatives. |
| F-3 Federal Electric Company. 19
618 Mission St., San Francisco. | T-2 Tubular Woven Fabric Company.
Pawtucket, R. I. |
| G-1 General Electric Co. 17-18
724 So. Spring St., Los Angeles; Worcester Bldg., Portland; Rialto Bldg., San Francisco; Colman Bldg., Seattle; Paulsen Bldg., Spokane. | U-1 United Sheet Metal Works.
575 Howard St., San Francisco. |
| G-2 Great Western Securities Corporation.
302-3-4 Hobart Bldg., San Francisco. | W-1 Wagner Electric Manufacturing Company. 14
St. Louis, Mo. |
| H-1 Habirshaw Electric Cable Co., Inc.
(See Western Electric Company.) | W-2 Western Electric Co. 16
Eighth and Santee Sts., Los Angeles; 1900 Telegraph Ave., Oakland, Cal.; 680 Folsom St., San Francisco; 907 First Ave., Seattle; 45 North Fifth St., Portland, Ore. |
| H-2 Hemingray Glass Co. 10
236-240 So. Los Angeles St., Los Angeles; 345 Oak St., Portland; 807 Mission St., San Francisco. | W-3 Ward-Leonard Electric Co. 15
Mt. Vernon, New York. |
| H-3 Haller-Cunningham Electric Co.
428 Market St., San Francisco. | W-4 Westinghouse Electric & Manufacturing Co. 5-6
50-52 East Broadway, Butte; Van Nuys Bldg., Los Angeles; Couch Bldg., Portland; 212 So. W. Temple, Salt Lake City; First National Bank Bldg., San Francisco; Second and Cherry Sts., Seattle; Paulsen Bldg., Spokane. |
| H-5 Hotpoint Electric Heating Co.
Ontario, Cal. | W-6 Westinghouse Lamp Co.
(See Westinghouse Electric & Manufacturing Co.) |
| H-4 Hubbard & Co. 13
(See Pacific States Elec. Co.) | W-8 Western Pipe & Steel Co.
444 Market St., San Francisco; 1758 North Broadway, Los Angeles. |
| H-7 Hurley Machine Co.
New York and Chicago. (See Pacific States Electric Co.) | W-9 Weston Electrical Instrument Co. 14
109 Weston Ave., Newark, N. J.; Frank E. Smith, 682 Mission St., San Francisco. |
| I-2 Illinois Electric Co.
261-263 So. Los Angeles St., Los Angeles. | Y-1 Youngstown Sheet & Tube Co.
Youngstown, Ohio. |
| I-3 Interstate Electric Novelty Co.
111 New Montgomery St., San Francisco. | |
| L-2 Locke Insulator Manufacturing Co. 20
(See Pierson, Roeding & Co.) | |

JOURNAL OF ELECTRICITY

VOL. XXXIX No. 4

SAN FRANCISCO, AUGUST 15, 1917

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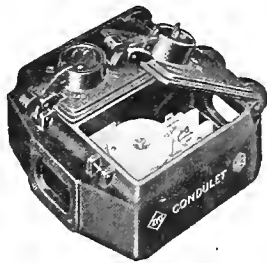
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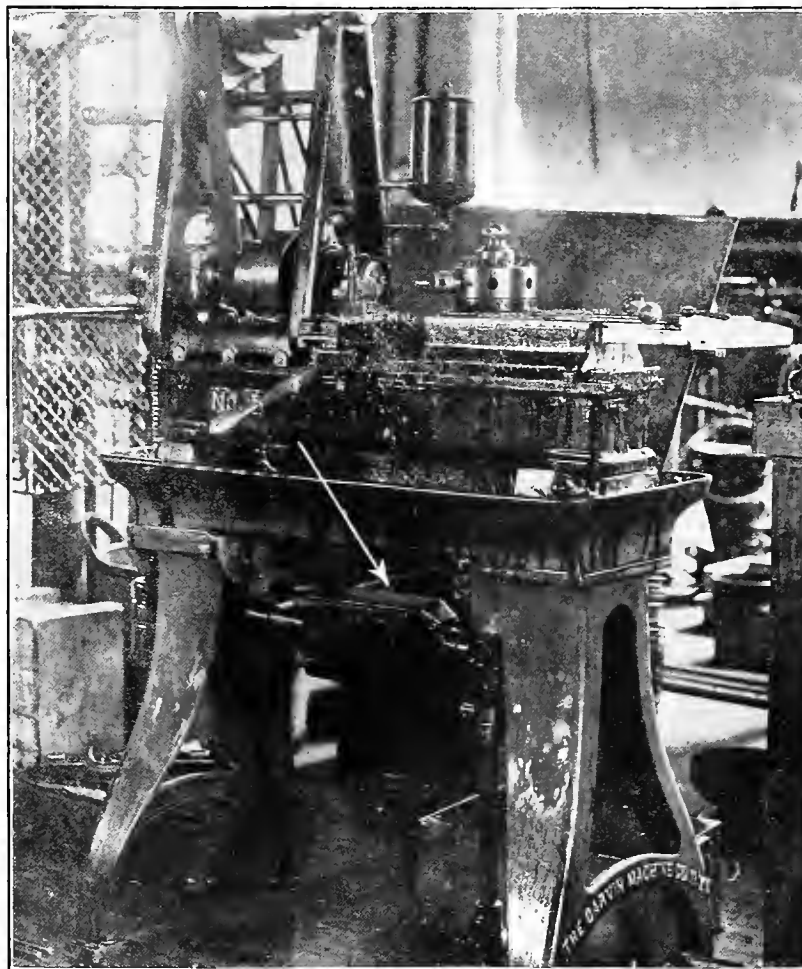
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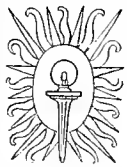
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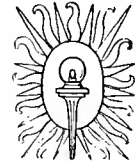
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JOURNAL OF ELECTRICITY



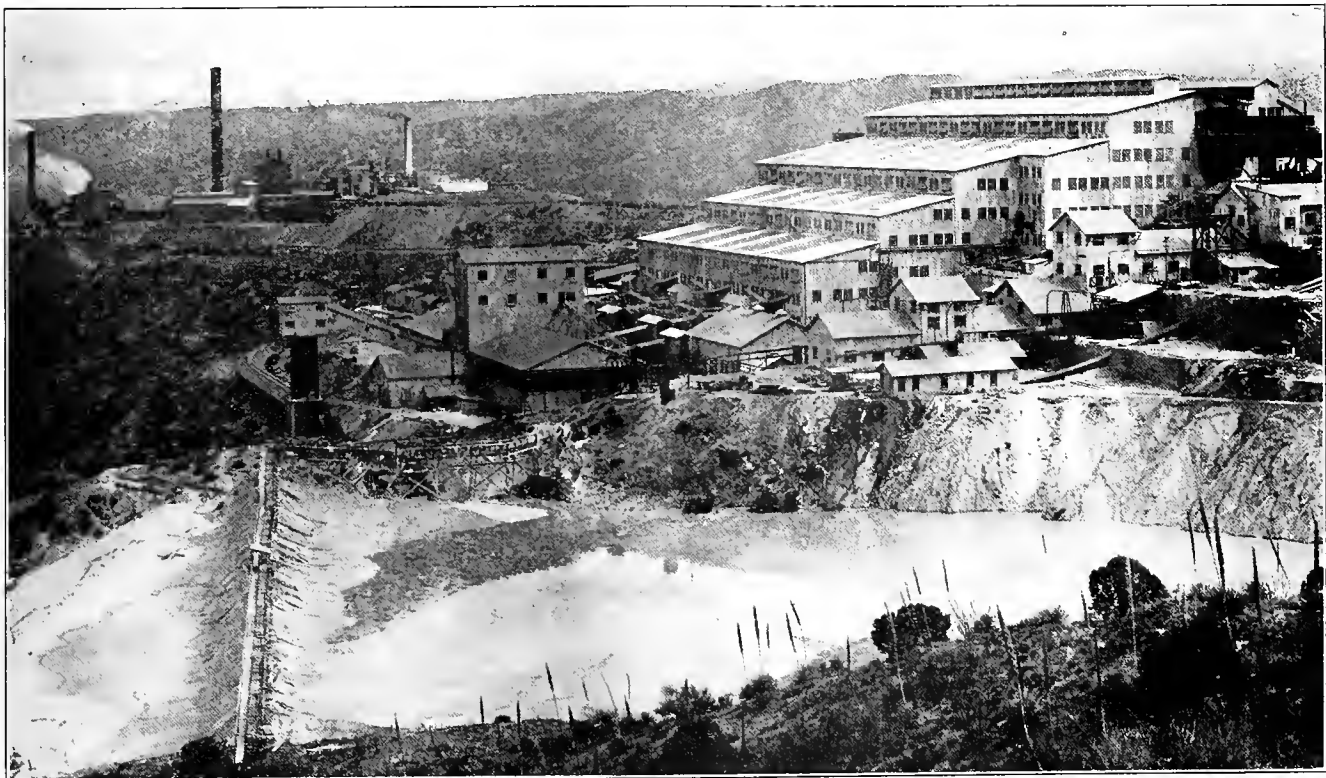
Devoted to the Generation, Distribution and Utilization of Energy

VOLUME XXXIX

SAN FRANCISCO, AUGUST 15, 1917

NUMBER 4

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Inspiration Mill, with Tailings Dam in Foreground and International Smelter and Power Plant in Background

THE ELECTRICAL WINNING OF INSPIRATION COPPER

BY A. H. HALLORAN

(Electricity in the great mining districts of the West is producing economic results hitherto unexperienced in the history of mining. Here is an article that tells how and why the great Inspiration Copper Company of Arizona is today on the lips of all who desire to point to present day efficient progress in electrical applications in mining. New economic ideas have been here worked out in fuel oil control that are exceptionally interesting as shown from detailed operating figures that are given. Interesting uses of electricity in mining, concentration and smelting are also set forth. —The Editor.)



Power Plant

economy and efficiency of their plants. Especially is this true in Arizona, where hydroelectric power is

ELECTRICITY is as essential to the mining, milling, smelting and refining of copper as is copper to the generation, transmission, distribution and utilization of electricity. Hence, Western copper producers are foremost among the industrial users of electric power to improve the

limited in amount and the chief reliance is placed upon prime movers driven by steam supplied from oil-fired boilers. Whatever lessens the oil consumption reduces the cost of copper.

Consequently the record of nearly 286 mean kw.-hrs. per barrel of oil which was developed during the twelve months' period from July 1916 to June 1917, by the Inspiration Consolidated Copper Company at Miami, Arizona, arouses interest as to the methods and equipment employed to attain this remarkable result.

Power for the operation of the Inspiration mine and mill and the International smelter is supplied by

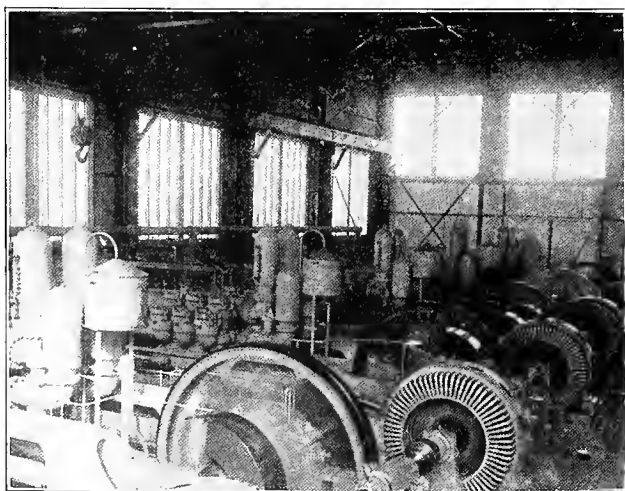
the U. S. Reclamation Service from the hydroelectric plant at Roosevelt Dam and from the Inspiration steam plant near the smelter. As the available hydroelectric power, transmitted 40 miles at 40,000 volts, is not sufficient to meet the requirements of the mine, mill and smelter, dependence must be placed on the steam station. Both sources supply 25 cycle current distributed at 2200 volts.

The power station, a substantial structure of concrete steel, houses three 6000 kw. turbo-generator sets with auxiliaries and three reciprocating blowing engines, each having a capacity of 15,000 cu. ft. of free air per minute and compressing to 15 lb. per square in. Steam is supplied from eight 713 h.p. boilers in an adjoining building and from seven waste-heat boilers served by waste gases from reverberatory furnaces at the smelter. Normally, the waste-heat steam supplies the blowing engines, the surplus passing to the turbine header; the oil-fired steam passes directly to the turbo-generators. Accurate measurement and records are kept as to relative amounts from each source. The smelter is credited with the steam generated and debited with power received. The waste-heat boilers recover approximately half the total heat in the oil burned in the reverberatory furnaces.

This article will be confined to the oil-fired plant, together with brief reference to the various uses of the electric current about the mine and mill. The remarkable operating efficiency obtained is entirely independent of the waste-heat plant.

Water Cycle

All of the new water used at the power house, concentrator and smelter is derived from six wells which have been sunk in the valley $2\frac{1}{2}$ miles to the east and 430 ft. lower than the mill. Each of these wells is equipped with a 24-in. multi-stage turbine pump driven by a 150 h.p. motor. All pumps discharge through wood-stave pipe-lines to a common sump-



Pumping Station Interior

tank having a capacity of 235,000 gal. A battery of six 1200 gal. per min. horizontal duplex, double acting pumps, direct driven through herring-bone gears by 300 h.p. 6600 volt Westinghouse synchronous motors raise the water to a 3,000,000 gal. concrete reservoir above the concentrator. The delivery main is a 20 in. steel pipe, 14,600 ft. long with a total rise of 520 ft.

Also by means of an elaborate system of tailings storage and settling ponds and pumps, water used in the milling process is recovered and returned to a mill head tank for re-use in the concentrator.

Raw water for the power plant is obtained through a 10 in. service from the reservoir with an emergency 10 in. tap from the 20 in. main.

The raw water consumption during November, 1916, which represents average conditions, was as follows:

House Service—Turbine room	277,200	gallons
House Service—Oil fired plant	107,100	"
House Service—Waste heat plant.....	88,400	"
Water to hot process purifier for boiler feed	3,122,800	"
Water to Booth softener for spray pond....	15,378,200	"

The condensate from turbines is pumped to an elevated tank, then circulated through Volz heaters in the condensers serving the blowing engines where the temperature is raised about 30 degrees F., then a Platt heater increases temperature to 180 to 190 deg. F.

Condensate only is supplied to the oil fired boilers, the surplus being mixed with sufficient treated water to meet requirements of the waste heat boilers.

The water to be treated for boiler feed make-up passes over a tipping weigher, through Volz heaters, where its temperature is increased from 60 deg. to around 130 deg. F., then to a Sorge-Cochrane hot process purifier, where it is further heated to about 205 deg. F., then mixed with proper proportion of lime and soda ash, settled and filtered.

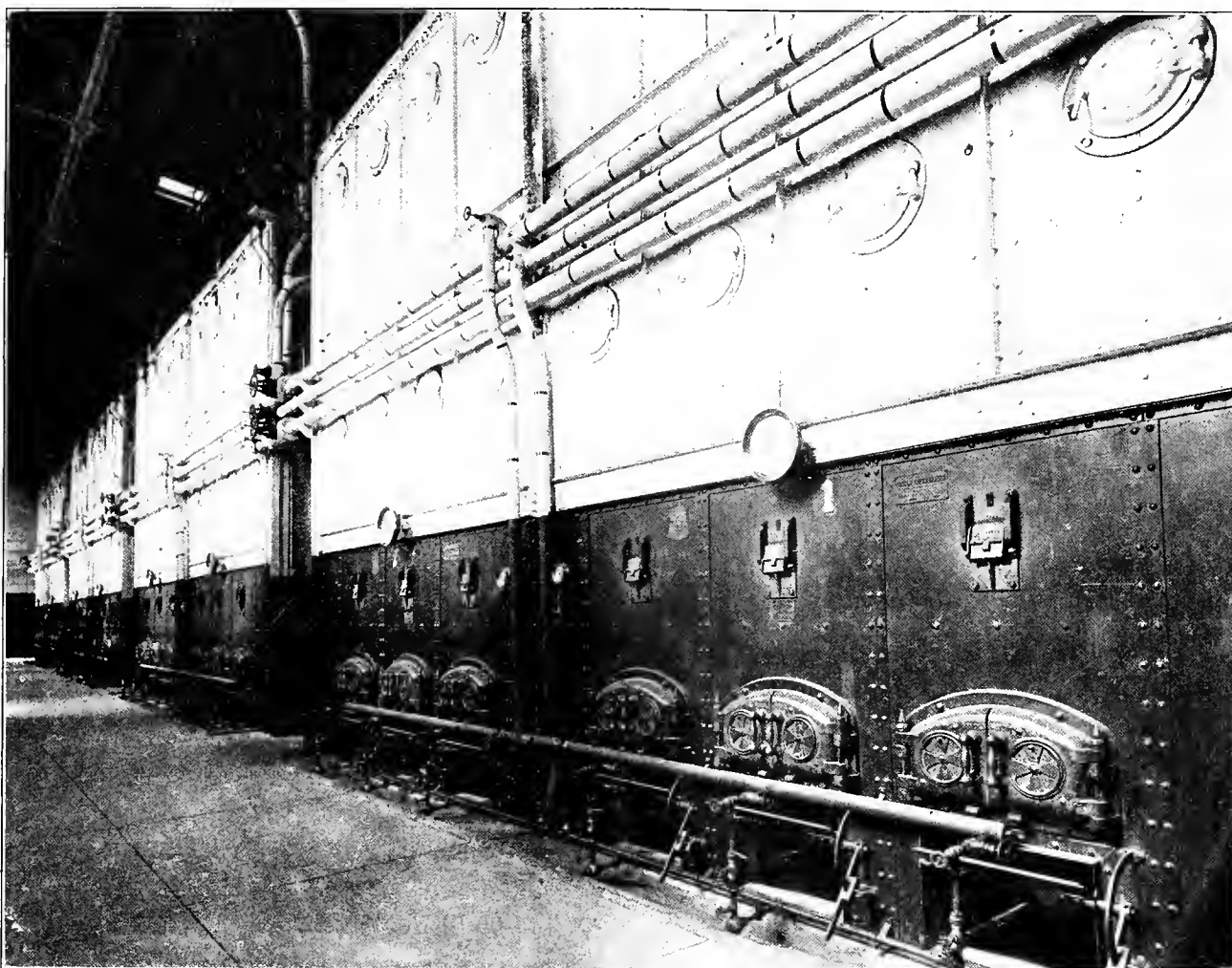
A Lea V-notch recorder and a Cole-Bergman tipping weigher in series check the quantity of water supplied to each boiler plant. The feed-water pumps at the oil-fired plant discharge into either one of two headers, one leading to a Green fuel economizer supplying water to the boilers at 230 to 240 deg. F., the other feeding directly to the boilers at 180 to 200 deg. F. in case the economizers are cut out.

All of these operations are controlled by a very complete system of piping and valves so arranged that in emergency there need be no interruption in the supply to the pumps. If the main pressure supply should fail, water may be drawn from the spray pond for feed pumps and turbine bearings. There is sufficient capacity in tanks on the roof to supply the cooling header for 30 minutes while the valves are being opened from the 20 in. main or the spray pond. A system of float alarms in tanks gives ample warning of any failure of normal supply.

All make-up to the spray pond is treated with hydrated lime in a Booth softener which reduces the carbonates to less than 2 grains to the gallon. In order to prevent excessive scaling of condensers the concentration of carbonates, the only salts in the circulating water which would be precipitated at the temperatures prevailing in the condensers, is not permitted to exceed 6-7 grain per gallon. During the period aforementioned 5,543,000 gallons of water was discharged from the spray pond to this end.

Oil Cycle

Fuel oil is delivered directly to the plant by rail. The oil is discharged from tank cars into a carefully calibrated receiving tank where the volume is meas-



BOILERS EQUIPPED WITH AUTOMATIC OIL FIRING SYSTEM

Here may be seen an improved system for regulating the fuel that is fed to the boiler furnaces. The oil supply is controlled from one central point, and with it, the steam used in atomizing the oil and the quantity of air admitted to the furnace are also under delicate control. Any fluctuation in steam pressure operates a governor whose power arm controls a bleeder valve on the oil pump discharge line, thus cutting off the oil supply, if the steam pressure is too high and reducing it if too low. Any change in pressure in the oil main, in turn, controls the amount of steam for atomizing and of air for burning the oil.

ured with a rod, corrected for temperature and checked against the invoice. A sample from each car is tested for gravity and moisture. Twenty single car samples are then intimately mixed and a composite sample tested in a bomb calorimeter for heating value and sulphur content. During the 12 months ending June 30, 1917, when 2065 cars of fuel oil were handled, the total shortage by volume and scale weight was 627 bbl., equivalent to about 0.1 per cent of the total quantity billed.

From the receiving tank the oil is pumped either to one of two 30,000 bbl. main storage tanks, supplying the power house and the smelter respectively, or to one of the 800 bbl. feed tanks.

The oil-fired plant now contains eight 713 h.p. Stirling boilers, fitted with asbestos steel casings lined and set in four batteries of two each. These units were designed for 210 lb. operating pressure, and are equipped with Foster superheaters which add slightly more than 100 degrees F. to the steam at rating.

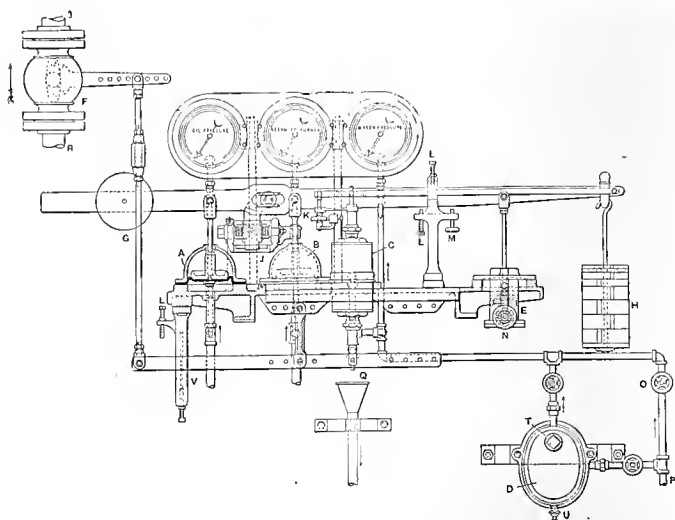
Four new boilers are under construction for the oil fired plant, and three additional units for the waste heat plant—all for 250 lb. working pressure. The new superheaters in the oil fired boilers will superheat the steam 140 degrees, and the present superheaters are

to be altered so that higher temperature steam will be obtained therefrom.

Perhaps the most interesting detail in the boiler plant is the automatic system of firing employed to minimize labor and improve efficiency in burning the oil. This is the Moore patent fuel oil regulating system which, from one central point, controls the oil supply, the atomizing steam and the amount of air to each furnace.

This regulator is actuated by the pressure from the main steam header so that any variation in steam requirements will cause a corresponding change in the amount of oil fired, due to an increase or decrease in the steam supply to the oil pumps and atomizers. Any fluctuation in steam pressure operates a governor whose power arm controls a bleeder valve on the oil pump discharge line, thus cutting off the oil supply if the steam pressure is too high and reducing it if too low. Any change in pressure in the oil main, in turn, controls the amount of steam for atomizing and of air for burning the oil.

It is found that a simple straight line relationship exists between the amount of steam required for atomizing the oil and the amount of oil burned. Two diaphragms are employed to balance the pressures in



Steam-to-Burner Regulator

the oil main and in the steam main connected to the burners, these pressures in this instance being 200 lb. and 80 lb. respectively. Any difference in oil pressure operates a rotary chronometer valve in the steam main through the medium of a fulcrum, water motor and lever connecting rod. Likewise the variance in oil pressure actuates a counterweighted rock shaft which moves the dampers so as to vary the amount of air admitted for combustion.

In operation, after the boilers are well loaded, the steam-to-burner regulator and the damper controller are carefully set and adjusted from a determination of the amount of CO_2 in the chimney gases. An occasional re-adjustment is required after a peak load is passed, the firing otherwise being entirely automatic.

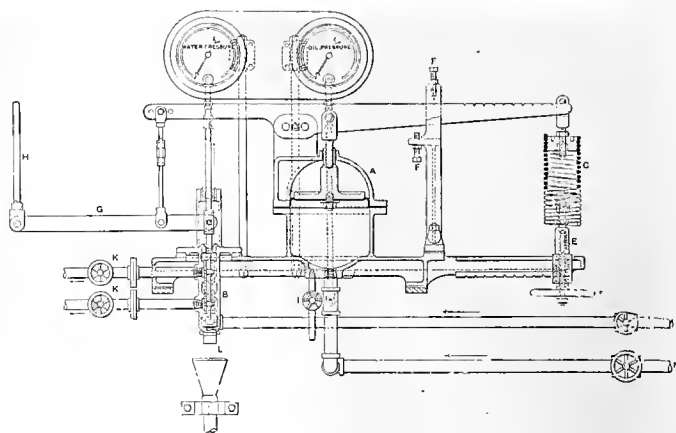
The main generating units are three in number, being 6000 kw., 6600 volt, 25 cycles General Electric alternators driven at 1500 r.p.m. by Curtis turbines. Steam is condensed in Wheeler admiralty surface condensers operated in connection with a spray pond for cooling the water and rotative dry vacuum pumps remove the non-condensable vapors from the condensers.

The spray pond is perhaps the one feature of this installation which is not giving entire satisfaction.

Little is known of the laws of cooling as applied to the reduction of the temperature of water mixed with air currents, and the manufacturers of spray apparatus have had small experience in the design of cooling systems of heavy capacity, such as would be required by a large power plant located in a warm climate, and remote from any considerable body of water.

The agreement is now quite general that the Inspiration spray pond should have been spread over at least twice its present area. Owing to limited ground space the pond cannot be extended the desired amount and additional cooling capacity is to be obtained by the installation of towers.

Considerable trouble has also been experienced from algae in the pond which flake off in large pieces and cause almost as much trouble as sea-weed on the coast. They seem to flourish with increase in the amount of carbonates and in warm weather especially.



Damper Controller

Of the numerous treatments that have been tried out, formaldehyde has given the most satisfactory results. While the growth can be prevented only by the use of such large quantity of the chemical as would be prohibitive in cost, a comparatively small amount administered at regular intervals will hold the growth in check sufficiently to prevent serious trouble.

Operating Results

An exhaustive set of operating reports are kept for each month, particular attention being paid to the pro-rating of water, fuel oil, auxiliary electric power, repairs, lubricants and labor to the International Smelting Company and the Inspiration Consolidated Copper Company, the joint owners of the power plant.

As the waste-heat steam is delivered to the turbine header at a lower temperature than the oil-fired steam, a deduction of 1 per cent is made for each 10.15 degrees that the waste-heat steam falls below the oil-fired steam to determine the equivalent value as delivered to the turbine feed. This factor of 10.15 was experimentally developed during factory tests. An example is afforded by the typical month of December 1916, when the waste-head plant delivered 38,278,600 lb. of steam at 431.2 degrees F. absolute, whereas 469.9 degrees was the temperature of the oil-fired steam at the turbine throttle. The equivalent quantity of waste heat steam, referred to oil-fired steam as standard would be

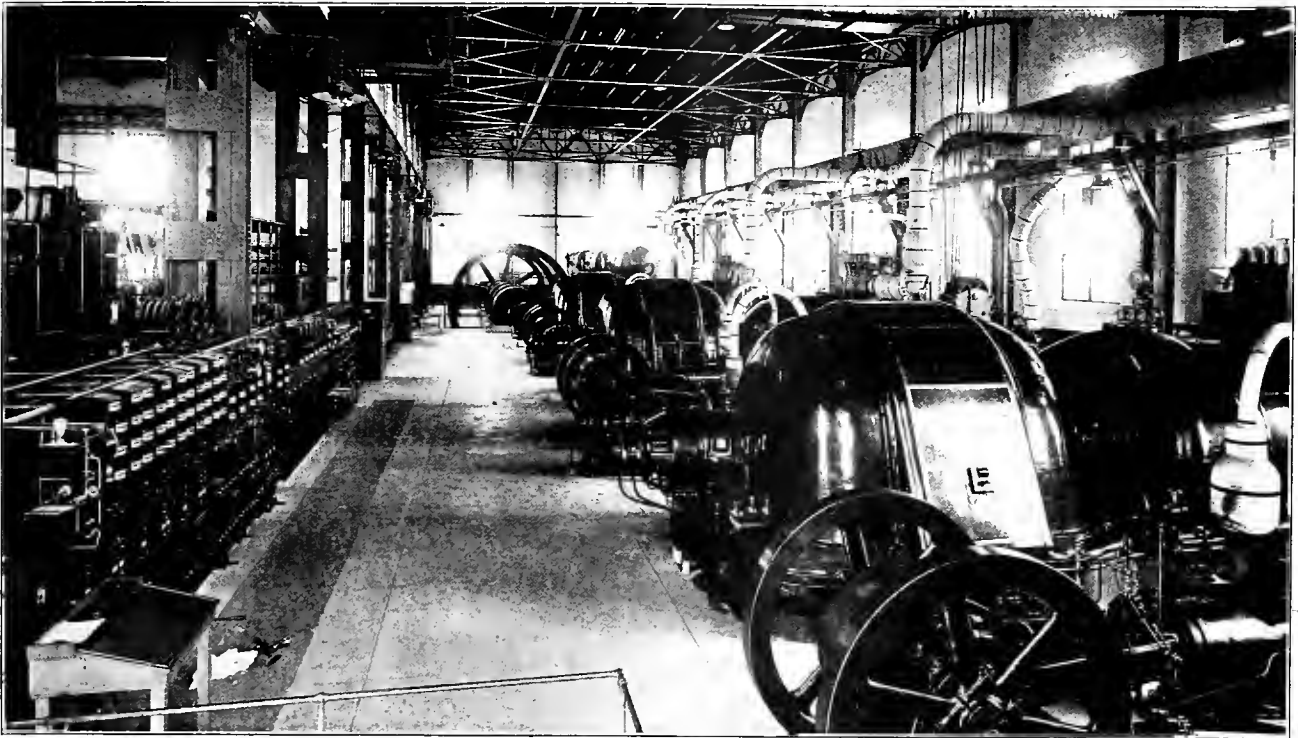
$$1.00 - \frac{(476.9 - 431.2)}{(10.15 \times 100)} Q = (1.00 - 0.45 +) Q \\ = 0.955 \times 38,278,600 = 36,553,400 \text{ lb.}$$

During the same period 16,512.8 bbl. of oil (including shortage) was billed against the oil fired plant; 77,278,300 lb. of steam was generated and 74,785,000 lb. was delivered to the turbines.

The total generation was 7,247,500 kw.-hrs., of which 23,751 kw.-hrs. was consumed in the process.

Allowing the waste heat plant a proportionate quantity of steam for boiler room auxiliaries as was consumed in the oil fired plant, the equivalent gross steam for electrical generation was

$7759/7479 \times (74,785,000 + 38,278,600) \text{ lb.}$
and the apparent economy of the electrical plant was



Power Plant Interior. Turbines in Foreground. Blowing Engines in Rear

$$\frac{77,278,300}{7729} \times \frac{\text{Net elec. production}}{(74,785,000 + 38,278,600) \text{ bbl. oil billed.}} = 289.3 \text{ net kw.-hr. per bbl. of oil billed.}$$

Had all of the steam used for electrical generation been generated by the oil fired boilers, the gross weight of steam would have been

$77,278,300 + 7729/7479 \times 36,553,400 \text{ lb.}$, therefore the plant economy, compensated for the lower temperature steam from the waste heat boilers which was used in turbines, was

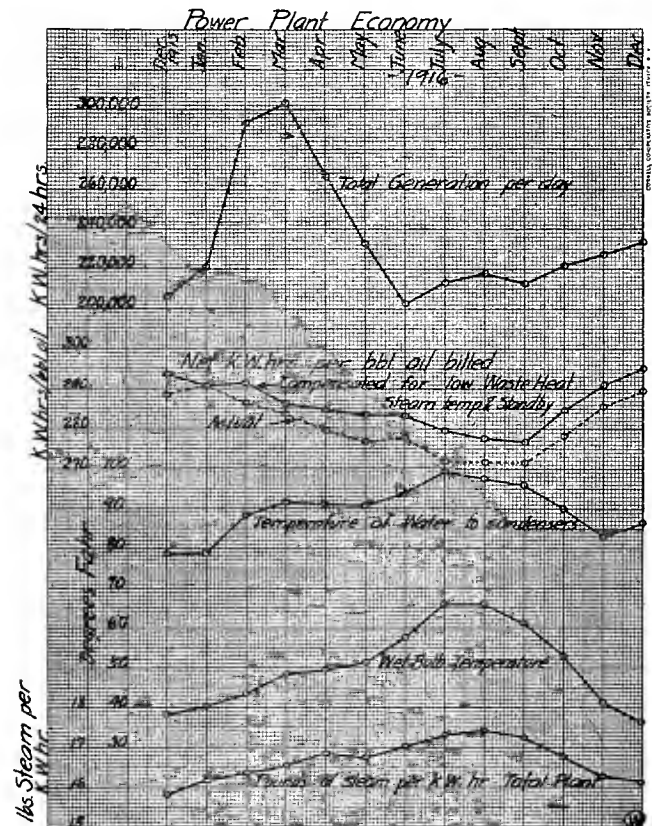
$$\frac{74,785,000}{74,785,000 + 36,553,400} \times \frac{7,223,749}{16,512.8} = 293.8 \text{ net kw.-hr. per bbl. of oil billed, compensated for lower heat content of the waste heat steam used.}$$

Under favorable load conditions in the winter, when the circulating water is cold compared to summer temperatures, slightly over 300 kw.-hr. per bbl. of oil has been developed. In the hot season, with injection water 100 degrees and higher, plant economy will fall below 280 kw.-hr. per bbl.

The distribution of electric power was as follows: 4,646,600 kw.-hrs. was delivered to the mill, 1,151,300 kw.-hrs. to the mine, 959,900 to the pumping plants, 231,844 to the smelter and 205,900 to the Miami Copper Company. The various power plant auxiliaries took 51,956 kw.-hrs. as follows:

	kw.-hrs.		kw.-hrs.
Hot process water treatment	150	Waste-heat boiler dept. 5,593	
Cold process water treatment	490	Converter air compression—Direct	26,398
Oil-fired boiler dept.	9,153	Electrical generation.....	10,170

Inspiration Cons Copper Co



Graph of Power Plant Economy

Re-distribution of first four items, gives converter air compression 27,906 and electrical generation 23,751. On the basis of the first 14 months' operation the average net efficiency of the boiler and economizer, after deducting the steam used for atomizing, was 82.9 per cent. The over-all thermal efficiency of the plant during December, 1916, with a machine



Inspiration Rock House. Shaft, Hoist House and Outdoor Substations

load factor of 82.5 per cent was 16.32 per cent using oil-fired steam as the standard, the average pressure on the turbine being 1.9316 in. mercury and the average temperature of the circulating water inlet to the condenser 76.81 deg. F.

Electrical Mining

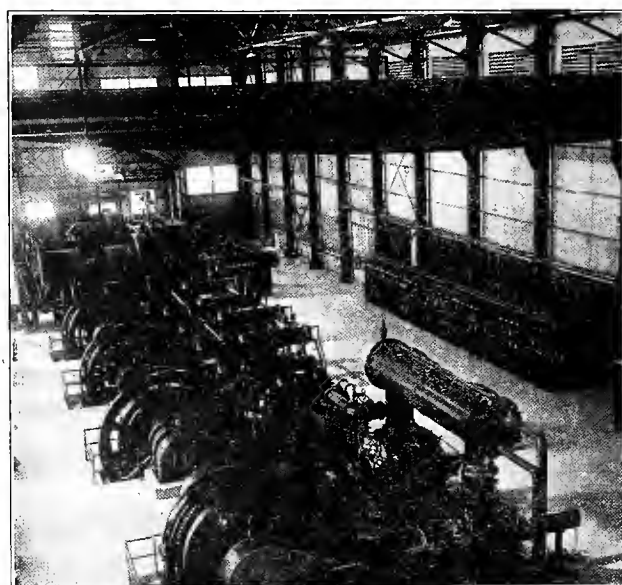
Of even greater interest than these remarkable operating results is the application of this electric power to the winning of the pure metallic copper from its ores. There is hardly a step in the long and intricate processes of mining, milling, smelting and refining which is not directly or indirectly dependent upon electricity.

In the mine, electric motors drive the compressors which supply the air for drilling the holes which receive the dynamite which shatters the rock. Likewise wise, with the compressed air locomotives, which haul the ore from the stope to the shaft. Electricity enters into the handling and crushing of the ore. The electric telephone establishes constant communication with all parts of the mine. Electric pumps carry off the water, electric lamps light the shaft, and an electric hoist handles the men.

Current is received at the mine substation from the Roosevelt Dam at 40,000 volts and from the stream plant at 6600 volts, being stepped down to 2200 volts by means of four three-phase transformers. In the power house is a 22 panel switchboard with remote control of incoming and outgoing circuits. Two 430 h.p. 2200 volt synchronous motors drive the two Ingersoll four-stage compressors which supply air at 1000 lb. pressure to the mine locomotives. There is also a 2-stage Nordberg driven by a 1150 h.p. synchronous motor and a 2-stage Ingersoll Rand compressor driven by a 500 h.p. motor which supply air at 100 lb. pressure to the rock drills. Two 100 kw. motor generator sets furnish exciting current for the four synchronous motors. A motor generator set gives direct current for the operation of the two 585 h.p. motors operating the two ore hoists and the 190 h.p. elevator motor running the man-hoist. All the

electrical equipment in the power house is of General Electric manufacture. Motors of 50 h.p. and over are operated at 2200 volts, while smaller motors operate at 440 volts. The entire equipment was designed to handle 7500 tons daily, but is giving an output of 22,000 tons.

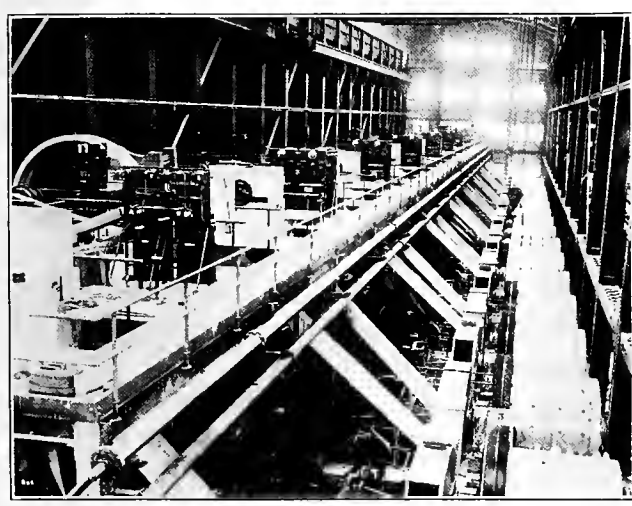
Crude ore from the stope chutes is hauled in 25-car trains by compressed air locomotives to the loading station at the shaft where the cars are dumped, five at a time, into 1600-ton ore pockets by motor-operated tipplers. There are two of these at the 600-ft. level, one for each of the two ore tables, and one at the 400 ft. level. These tipplers are driven by 35 h.p. Westinghouse motors running continuously in one direction



Interior of Hoist House, Showing Compressors and Hoists

and geared to a driving shaft which is engaged by a friction clutch on intermediate shafting for starting and stopping the tipplers. Each tippler is 56 ft. long and dumps the cars by making a complete revolution in 15 seconds.

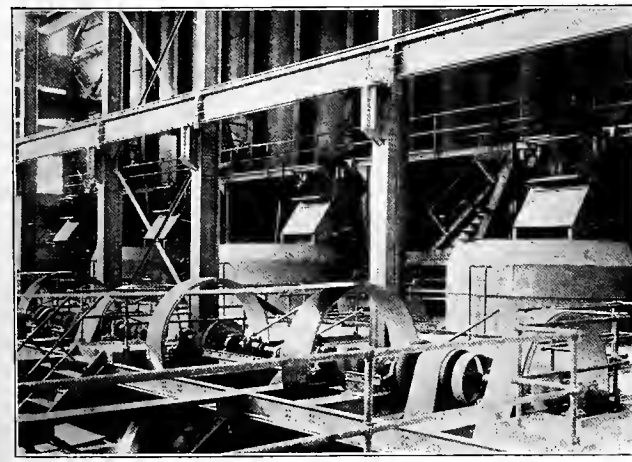
The ore skips are hoisted in balance, the hoists having cylindrical drums 10 ft. in diameter with 65 in. face. Each carries 1000 ft. of 1¾ in. steel cable. The skip, in descending, is automatically filled from a weighing machine at the ore-pocket chute. The skips automatically dump into bins supplying the crushers.



Ball Mill Starting Panels and Motor Platform

The main crushing plant is operated in four units, each consisting of a No. 8 gyratory crusher, crushing to a maximum of 3¼ in., a 30 in. belt conveyor and two 48 in. Symons disc grinders crushing to 1½ in., the unit being belt driven by a 200 h.p. motor. Two 150 h.p. motors drive a belt conveyor lifting the crushed ore to a sampler and distributor, which by means of four 50 h.p. motors on moving carriages deliver the ore into 25,000 ton storage bins. The crushed ore is then hauled in cars to the concentrating mill in 14-car trains by steam locomotives. The plant is also equipped with two 20-ton electric cranes.

The man-hoist is in a separate shaft-compartment and is operated from the cage, the hoist, motor gen-



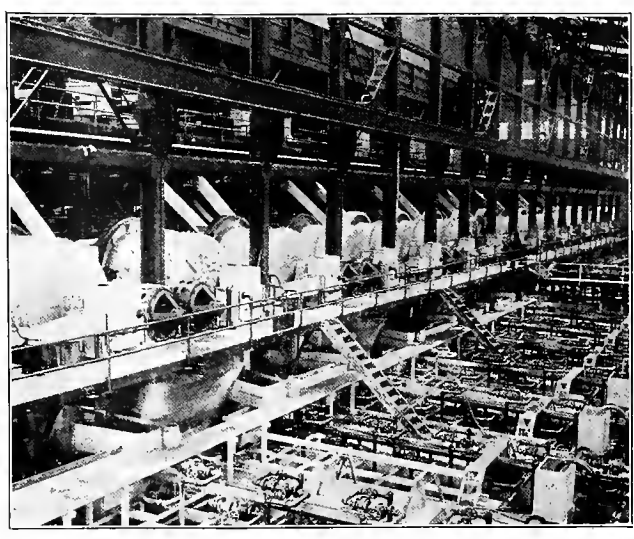
Gyratory Crushers and Drive

erator set and control apparatus being in the hoist house 220 ft. distant. The cage is also equipped with a telephone and annunciator system. The hoist is driven by a 158 h.p. d.c. motor, getting its current from a 130 kw. motor-generator set.

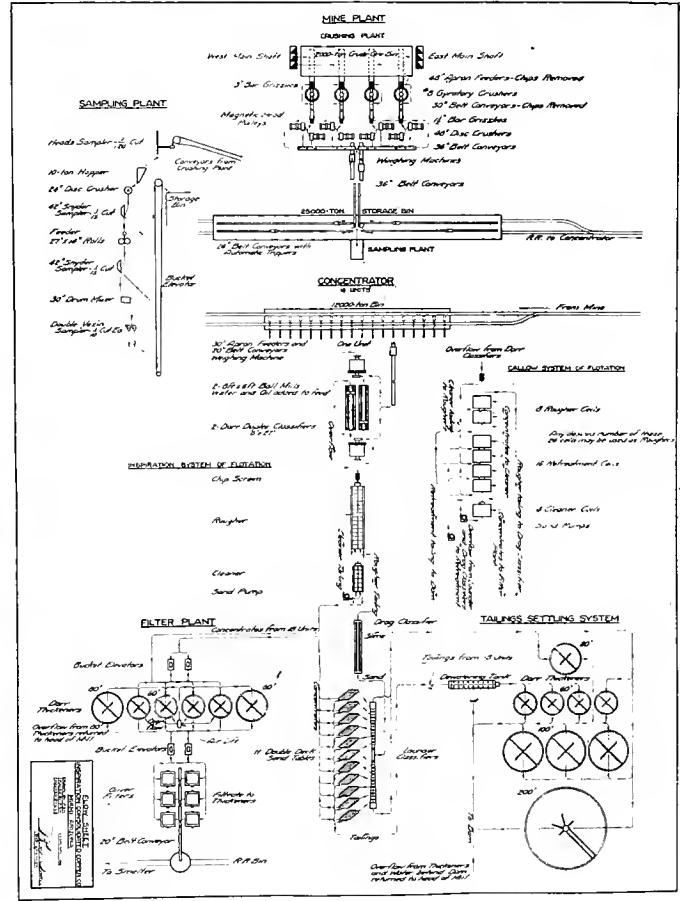
Electrical Concentration

At the concentrator, 1¾ miles from the mine, is another outdoor substation having eight 2000 k.v.a. oil-

insulated, water-cooled, three-phase transformers, four on the 40,000 volt line and four on the 6600 volt line. These step down to 2200 volts, the circuits being led to a separate building housing a 13-panel switch-board, each panel being provided with double throw switch for connection to either the hydro or the steam



Many Ball Mills and Flotation Machines



Flow Sheet

supply. Six panels care for the six concentrator units, three for the centrifugal blowers, and one each for lighting the filter plant, shop room and Root blower. There is also an 11 kw. motor generator set for electrolytic work in the assay office.

The function of the concentrating mill is to separate the copper sulphide (chalcocite) from the rock in

which it is finely dissimulated. This is accomplished by a series of crushing and flotation operations which will be briefly described.

From the 12,000 ton receiving bins eighteen 30 in. apron feeders deliver the ore to a 20 in. inclined conveyor belt driven by a 50 h.p. motor, the belt discharging into two hoppers which supply the six concentrating units.

Each of the concentrating units consists of a Marcy ball mill and a Dorr classifier, together with flotation cells which treat the overflow from the classifier. The ball mills crush the ore so that 60 per cent will pass a 200 mesh screen and 38½ per cent more a 48 in. screen. This slime forms the overflow from the classifier which is treated in the flotation cells, the oversize being returned to the mills for re-grinding. Each ball mill is driven through herring bone gears and a Franckel flexible coupling by a 225 h.p. three-phase induction motor. A 50 h.p. motor drives each of the six classifiers and conveyors.

Three types of flotation machines are in operation, four sections being equipped with Callow machines, thirteen with Inspiration machines and one with a Mineral Separator machine. These give three products, a clean concentrate which goes to the filter plant, a middling which goes to a drag classifier for retreatment and a tailing which goes to waste. A detailed description of the process is unnecessary here, it being deemed sufficient to state that a small amount of oil added to the ore in the grinding mill coats the sulphide particles but not the gangue; the mixture is allowed to flow through a series of cells into which low pressure air is admitted so as to agitate the mixture and form a froth which carries the copper sulphide and is floated off the surface. The tailings from the first roughing treatment are pumped back for retreatment by a sand pump driven by a 50 h.p. motor, the tailings from this treatment being concentrated on Diester belt tables driven by a 105 k.v.a. synchronous motor.

Low pressure air for the flotation cells is supplied by four centrifugal compressors, each having a capacity of 23,000 cu. ft. of inlet air per minute and discharging at a pressure of 5.75 lb. per sq. in. They are driven by a 720 h.p. motor.

The concentrates from the flotation cells and tables, containing 90 per cent water, pass to five Dorr

tanks where they settle to the bottom and are drained off as a thick pulp containing 42 per cent moisture, while the overflowing clean water goes to the return water sump. The thickened pulp is elevated to Oliver filters which reduce the moisture content to 17 per cent. The concentrates are then carried in hopper-bottomed steel cars to unloading bins at the smelter where they are sampled and delivered by belt conveyor to bedding bins for mixture with limestone and pyrite.

Mine and Mill Power Consumption

The following table shows the power consumption at the mine and mill for August, 1916:

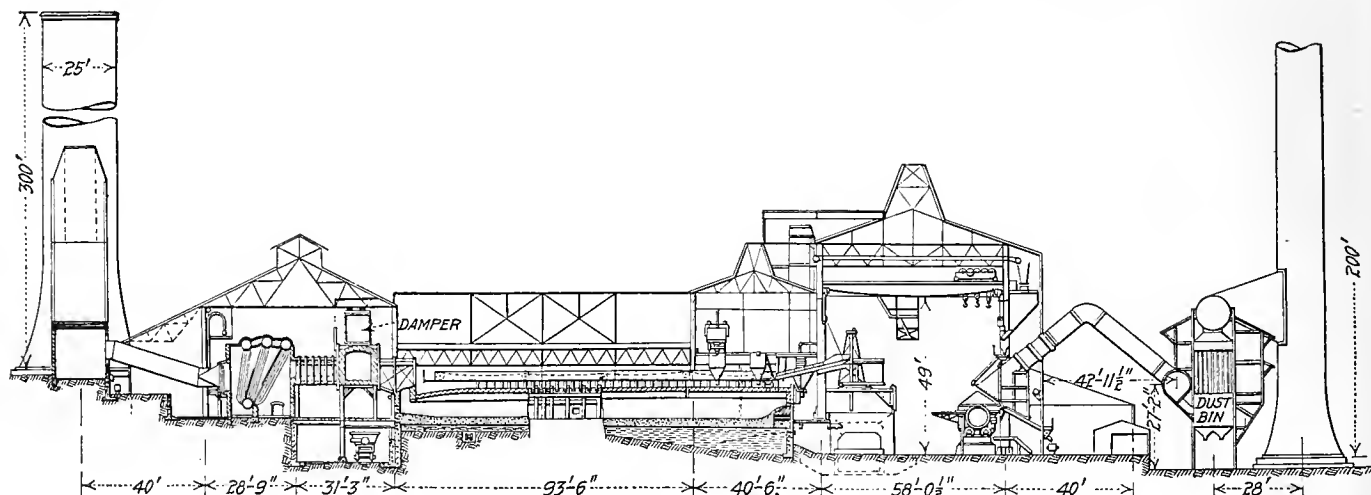
Power Consumption at Mill and Mine				kw.-hrs. per ton	
Mining—Tons mined, 493,900—		kw.-hrs.			
Power for machine drills and vent, 100 lb. air.	651,300			1.319	
Power for air hauling, 1000 lb. air.....*	185,790			.376	
Power for ore hoisting.....	358,320			.725	
Power for lights	9,300			.019	
Power for miscellaneous mine dept. uses.....	59,760			.121	
				1,264,470	2.56
Coarse Crushing, Conveying and Sampling:					
Tons treated, 493,900.....	201,000				.409
Concentrator—Fine Crushing—					
Tons treated, 498,270.....	4,914,980				9.86
Flotation	1,576,670				3.16
Tables—		Tons	kw.-hrs.		
Power for tables.....	182,760	245,790	.74		
Power for drag belt classifiers, separating sands for concentration	20,430	469,274	.04	203,190	.41
Filters—					
Concentrates					
Kilowatt hours per ton	5.71			109,110	.22
Tailings Disposal—					
Motors for Dorr dewatering tanks.....	4,980				.01
Water Reclamation—					
Repumping water from settling ponds.....	941,365				1.89
Sundry Power—					
Machine and carpenter shops, incline hoists, etc.	30,950				.06
Lights	25,170				.05
Pumping New Water.....	655,485				
Lights	1,320	656,805			1.32
Crushing Rock for Concrete.....		1,000			
Lights for Offices, Dormitory, Dwellings, etc.....	1,410	8,666,630			
Total kilowatt hours.....				9,931,100	19.95
					kw.-hrs per ton
Power for mining					2.56
Power for milling					16.07
Power for pumping new water.....					1.32
					19.95

ton of daily capacity.

*Average mine haul, .475 miles. Kilowatt hours per ton mile, .796. The average power requirement in August was .83 of a kilowatt per

Electricity in Smelting

The smelting of sulphide copper concentrates consists primarily in the elimination of sulphur by heat



Typical Cross Section of International Smelting Company's Plant.

just as mill concentration is essentially the elimination of silica by water. The heat is primarily produced from fuel oil and secondarily from burning sulphur. Consequently every effort is made to minimize the oil consumption, just as the millman tries to conserve his water supply. Thus the smelterman and millman are as much interested in saving oil and water as is the power plant engineer.

At the smelter the concentrates are first dried in five Wedge mechanical roasting furnaces which employ fuel oil to remove the last trace of moisture, 5.51 gal. of oil being required per ton of concentrate treated. The temperature is kept low enough to prevent roasting of the ore as the concentrates do not contain enough sulphur to avoid making a copper matte so high in sulphur that the slag is not clean. This is why pyrite is added to the charge.

As the gases from these calcines carry much flue dust a Cottrell electrical precipitation equipment has been installed to recover the dust. In this process a high voltage electric discharge cleans the gases of all dust. This installation consists of 12 rectifying units which supply uni-directional current at from 50,000 to 100,000 volts. For each of the 12 units the dust collects in 20 tubes, 13 in. outside diameter and 15 ft. long, the dust being shaken off by striking the tubes with hammers.

The calcines from the Wedge furnaces are mixed with siliceous ore and limestone and then charged into three 21 x 100 ft. reverberatory furnaces, the charging being accomplished by motor-driven drag-chain conveyors. By the aid of .79 bbl. of oil per ton of charge the copper matte is produced from the calcined concentrates. Through the agency of Stirling boilers, installed between the furnaces and chimney, about half the heat value of this oil is recovered as steam as has heretofore been explained.

A graphic log is kept each month to check the results from the waste heat boilers. This shows the market value in dollars of the steam delivered, the amount of oil burned in the reverberatories, the total equivalent evaporation, the equivalent unit evaporation, (lb. H_2O /lb. oil) the temperature of the exit gases and the degrees of superheat.

Electric cranes of 40 ton capacity carry the copper matte from the reverberatory furnaces to the five converters when the last trace of sulphur is burned out by blowing in 12 lb. air from the Nordberg engines in the main power plant. Each converter produces 95 tons of copper daily which is cast into 247 lb. bars for shipment to the refineries. An electric railway system handles the slag cars.

Thus has been briefly sketched the electrical winning of metallic copper from its ores and sulphides. In conclusion the writer wishes to express his indebtedness for information obtained and courtesies granted from W. W. Jourdin, chief engineer of the Inspiration power plant. The general layout for the power plant was made jointly by Mr. John Langton, consulting engineer for the Inspiration Copper Company, and by Chas. C. Moore & Company, engineers. Final details of the installation and development of economy were left to Chas. C. Moore & Company, to whom their chief engineer, C. R. Weymouth, fur-

nished information regarding sizes of apparatus. Seldom are such economies practiced and such high efficiencies obtained in industrial power installations. Great credit is due for the wonderful showing made.

METAL FLUME AND ITS VALUE FROM AN ECONOMICAL STANDPOINT

In making plans for new irrigation projects, or the betterment of the existing one, it should be the object of the engineers or the people interested to get out of every dollar invested the greatest possible return, in service. Experience has fully demonstrated that the wooden flume for conveying water to an irrigated district is a thing of the past. The very best life that can be allowed for a wooden flume is from eight to twelve years, and after the sixth year, the maintenance charge becomes almost prohibitive. These are facts from experience.

The usual bonds sold for irrigation purposes run twenty years and it would be very hard at the present time to get a financial institution to consider buying the bonds of a district which contemplated building their flumes of such a material that at the end of a period of twelve years they would be called upon to refinance for rebuilding the flume. In making this investment in wooden flumes you are really furnishing a security that has a life of a little over one-half of your financial obligation. Then you are confronted with raising more money to replace the original wooden flumes, which money immediately begins to bear interest besides having to pay for eight years interest charges on your original investment. In buying a metal flume of the proper type, made of the right metals, you will probably expend slightly more in your first investment, but there will be no period during the life of your bond issue, or for years after, when you will have to come before the people and ask a new issue of securities on which to obtain money to replace your flume. The question often arises, if the district expends money for a metal flume, how about the wood substructure? Experience gathered from nearly all the irrigated districts conclusively shows that with a metal flume you eliminate leakage, and it is the leakage from a wooden flume that causes the substructure to deteriorate and washout the foundations. The value and equal distribution of water on all the projects is becoming of vital importance.

In building the wooden flume you not only have to consider the weight of the water which is transported, but the weight of the flume box in itself is quite an item. Compare these weights with the weight of a metal flume, and you can readily see why the cost of light substructure used with the metal is so much less. The erection cost of the substructure used with the metal is also lower and the maintenance charge is a very small fraction of that of any other type. In the Yakima country there is a case of a ditch rider who looks after twelve miles of ditch. On the twelve miles there are seventy measuring headings, within this limit there is thirty-eight hundred feet of metal flume in eleven sections. Before this flume was installed it required the services of two and sometimes four men to look after these eleven weak spots,

WATER WORKS AND ITS BEARING ON RATE FIXING

BY C. E. GRUNSKY

(In a consideration for rate fixing of water works, the ratepayer's rights, the owner's demand, and the unlimited life method of procedure call forth most careful attention. Here is an article that discusses all these factors which should prove immensely helpful to engineers throughout the West where these questions have in the past proved so perplexing. The author is a consulting engineer at San Francisco and a well-known writer and authority on the subject of rates.—The Editor.)

If water-works are under consideration the circumstances may be about as follows: The water-works have been long in service. They were originally built by a group of public spirited citizens and operated at a loss. This loss may or may not have been a willing sacrifice offset by the growing value of the real estate in the individual possession of the owners. As the community grew, the water-works grew. The original source of supply may have been wells which had to be abandoned after a time because contamination rendered the water unfit for domestic use. Other near-by sources were brought into use, some retained and others abandoned. The system, as now in use, commands a supply of good water adequate in quantity for some 20 years, with other sources in sight that can be developed at an increasing unit cost. There has been no satisfactory regulation of rates in the past. The original owners have passed out of consideration and the stock of the corporation now owning the property is in the hands of many people, some of whom have acquired it within the last year or two. The bonds which are outstanding,—about \$7,000,000—bear interest at 6 per cent and are worth 95 per cent. There is no alternative supply having advantages equal to the developed and prospective sources. There has been no payment for franchises. The acquisition of certain water-rights representing one-fourth of the supply has cost the company \$200,000. These water-rights were acquired 10 years ago.

In this instance the books show the cost of construction during the recent years and the cost of the acquisition of some of the lands and rights-of-way, but there is no information available relating to the actual investment covering the entire period of operation nor yet relating to whether the earnings fully amortized the capital which had been invested in the property abandoned from time to time. An investigation is therefore made to verify and to supplement the records of cost and it is found that, including the cost of rights-of-way and the actual cost of water-rights, whether taken from records or approximated, the total actual legitimate capital investment as of the date of the proposed rate regulation is \$10,000,000. In this appraisal, market value of real estate is included when its acquisition was not recent and does not appear in the records. Cost and an allowance for the increase of value may in many cases be a good guide in determining at what value it should be introduced as a part of the invested capital. In this valuation of \$10,000,000 there are included all properties in use and those held for use within a rather indefinite period of some 20 to 25 years in the future.

If the value of physical elements and the value of the intangibles must be taken into account, as the courts and many of the rate regulating commissions seem to require, it now becomes necessary to approximate the accrued depreciation of the physical elements,

This is done by approximating for each class of items or for each item which is of sufficient importance to be individualized, its remaining term of usefulness or expectancy and from depreciation tables for the probable life term new of each class and this life expectancy, the accrued depreciation and the remaining value are found. This tedious, difficult and unsatisfactory proceeding shows for these water-works that the accrued depreciation is \$2,000,000.

Going value is now to be appraised. For this there is absolutely no basis because it results from the increment of earnings which is left after deducting operating expenses, current depreciation or, rather, replacement requirements, and interest on the investment. The best judgment of experts is called in, and their chief aim will be to at least offset the accrued depreciation. The result is an allowance of about \$2,500,000 for going value.

Now comes the question of water-rights. One-fourth of the water in use has actually cost \$200,000 and this amount is included in the \$10,000,000 of investment. If one-fourth of the water cost \$200,000 and the remainder is equally valuable there should appear in the "value," if itemized, an additional \$600,000 for water-rights and perhaps more, because the basis of this calculation is a value which obtained 10 years ago.

The most common practice of the day would, therefore, start with a valuation, being the present or fair value as follows:

Physical elements and actual cost of rights-of-way and of water rights, less accrued depreciation	
\$10,000,000 — \$2,000,000 =	\$8,000,000
Water rights, value in addition to cost.....	600,000
Going value	2,500,000
Present value	\$11,100,000

It being assumed that this enterprise is in every way legitimate and well managed, the value of the outstanding bonds and their rate of interest can be used as a guide to determine what the rate of return should be on this valuation.

At 95 per cent the 6 per cent bonds net 6.3 per cent. The cost of marketing the bonds was probably at least 1 per cent. It is likely, furthermore, that at the time the bonds were issued the amount realized was less than 95 per cent. It is concluded from such facts as these that the cost of money for this enterprise should be taken at 7 per cent and that of the rate of return on the value of the water-works should be 8 per cent.

Investigation has also been made of the cost of operation and it is found that

Ordinary average annual operating cost including maintenance and repairs is.....	\$400,000
The average annual replacement requirement based on actual experience is.....	200,000
The estimated current depreciation by sinking fund methods which should have been earned from the beginning is found to be.....	64,000

In determining the required earnings what allowance shall be made for current depreciation? This

must be settled by those using this procedure with due consideration to the facts in each case. There is no depreciation or replacement fund in this case, consequently there is no interest on such a fund to supplement the estimated current depreciation. The earnings must cover the annual replacement requirements which are best determined by actual experience but which can also be approximated by well known methods of procedure. Using the result of actual experience in this case the required earnings are now estimated as follows:

Required Earnings—	
Operating expenses	\$ 400,000
Replacement or depreciation allowance ordinarily estimated but in this case determinable from actual experience at.....	200,000
Return allowance 8 per cent on \$11,100,000.....	888,000
	<hr/> \$1,488,000

The application of the simple alternative procedure in this case is as follows:

The rate-base is the legitimate investment, \$10,000,000.

Required Earnings—	
Operating expenses	\$ 400,000
Interest 7 per cent on \$10,000,000.....	700,000
Replacement requirement	200,000
Profit allowance 12 per cent of \$1,500,000 (approx. gross income)	180,000
	<hr/> \$1,480,000

The one procedure is logical throughout. The other is not. In the alternative the going value and the water-right value are fully covered in the capitalized profit allowance. In connection with the rate-fixing proceeding there is no need of separating these intangibles nor even of inquiring whether if abandoned by the utility the water-right might not have a higher value than a fair division of the profit allowance would give it. The full protection of the investment is secured and the rate-payer is given the satisfaction of knowing that there is a limit set to the profit which the owner of the utility may make in the future. Once the basic valuation has been made, as above set forth, the appreciation of real-estate and other items would be covered in the profit allowance. Additional appreciation would not again be carried into the rate-base, but if appreciating property were at any time in the future released from further public service, its full value, including all appreciation, would go to the owner at that time.

The valuations thus far required by all rate-fixing authorities have been made with careful attention to the smallest details. A standard has been set for the approximation of the cost of reproduction of the plant, to be valued, which would be commendable, except for the fact that the careful estimate of physical value is at once supplemented by the crudest kind of an approximation of intangible values. No basis has been established or found of determining the principal intangible item "going value" and yet an arbitrary allowance for the same, always crudely approximate and at times amounting to or even exceeding the value of the physical elements, is added and given rank and weight with the latter. The sooner such a practice can be modified the better.

What the rate-payer has a right to expect may be summarized as follows:

- (a) Good service, the best that conditions permit at reasonable rates.
- (b) A share in the unearned increment when general prosperity gives this to the owner of the utility in too large a measure.

(c) A reasonable share, in the course of time, in the benefit which results from any material reduction in operating costs due to the introduction of inventions or new processes which the owner's good management and skill have shown to be advantageous.

(d) A contribution by the general public toward the maintenance of the utility, which may be secured by a liberal payment for service rendered for commodities furnished to the public or to public institutions or which may be secured by a remission or local taxes in whole or in part.

What the owner should demand is:

- (a) Interest on the capital legitimately invested.
- (b) An ample allowance for replacements and renewals.
- (c) An ample allowance for operating expenses.
- (d) Amortization of capital invested in abandoned property.
- (e) Compensation for management and for assuming business hazards.
- (f) A share in the general prosperity which his utility helps to create.
- (g) In the special case of a limited life of the utility or its acquisition by the public, a return of the invested capital.
- (h) That amortization of the invested capital be not confounded with accrued depreciation.

What both the rate-payer and the owner are entitled to in addition to the above and what both should demand is:

The introduction of a method of procedure when rates are to be regulated which will not require an array of valuation experts, to pad a close estimate of physical values with a number of arbitrary intangible values, but which on its face will be intelligible and fair to all concerned.

The items (e) and (f) as enumerated under the owner's demands can best be met as already explained by making an adequate minimum profit allowance based on the annual gross income.

If the rate-payers are few and a reasonable service rate will not fully compensate the owner, then he should be held harmless in the future larger returns.

In the case of the business which has been operating without regulation and which is to be brought under regulation, the present owners should not be made to suffer unnecessarily for the mistakes and improper business methods of their predecessors.

Once the determination of the natural rate-base has been made, the future modifications thereof should be from the book records which should be such as to show at all times the additional capital legitimately invested, the discarded property and its cost, and the condition of the replacement fund, which latter should be just adequate to meet the regular demands upon it for replacements or renewals, and, if desired, also the repairs and generally unkeep expenditures.

The bringing of accrued depreciation into the calculation as though it represented amortization of a part of the investment is absurd; it leads to a complex, unsatisfactory procedure, and compels the use of arbitrary allowances for intangible values which should have no place in a rate-base. All methods of procedure which take account of the accrued deprecia-

tion when rates are to be regulated should be definitely and finally proscribed, and eliminated from consideration.

In December, 1916, a special committee of the American Society of Civil Engineers rendered a report on the Valuation of Public Utilities in which they accepted the apparent requirement of the courts, that value be ascertained and made the starting point when rates are to be fixed. The committee strongly advocates the use of a method of procedure which it calls the compound interest method in distinction, from what to many others has appeared as the more logical, the sinking fund method. Under the compound interest method the value, of the physical elements is to be ascertained from time to time, perhaps from year to year, by deducting accrued depreciation, and the allowance for current depreciation of each individualized article is to be a gradually increasing amount, readily computed from original cost, probable life new and age. The committee overlooked some of the difficulties of applying this method to one of which attention may be briefly called. This is apart from the fact that the compound interest method like any other method which pretends to start with value in any form, is illogical and should be condemned. The committee explains how the current depreciation, which they should have called amortization of capital, can be computed or can be taken from tables for any year of the life of an article whose probable life new is known. But the committee fails to point out how to proceed when of a large number of articles, such as locomotives, some fail before their predicted term of usefulness has expired and others survive long beyond this term. Neither the sinking fund method nor the compound interest method takes this non-agreement into account. A mathematical solution has not been attempted by the advocates of these methods. None is possible, as a matter of fact, until the expectancies at various ages for the various articles under consideration shall have been determined with some degree of accuracy. The probable life is merely the average of all available records of service. It is the result of the recorded human experience with all articles of any class. While this probable life new may be predicted with some degree of confidence for many articles, the individual articles of any class will depart widely from the term of life predicted for them as a class. The probable life being a mean of the actual terms of service of numerous articles, there will be among these articles for each one which fails m years before the expiration of its probable term, another which survives m years beyond this

term, or two which survive $\frac{m}{2}$ years beyond the term, or three which survive $\frac{m}{3}$ years beyond the term, and so on.

Suppose that a large number of locomotives of a certain type are under consideration, whose probable life new has been correctly estimated at 20 years. For each locomotive which fails and is discarded 10 years before the end of the 20th year after it went into service is reached, there will be one surviving

to the end of the 30th year or two surviving to the end of the 25th year or three whose average service beyond the predicted period is 3.33 years and so on.

Introducing 7 per cent into the calculation and following the ordinary erroneous practice, the depreciation (or replacement) allowance for the first year would be in percentage of cost for four locomotives:

Replacement requirement, ordinary allowance (current depreciation) 1st year $4 \times 2.44 \div 4 = 2.44\%$

Compare this with the following illustration of what is bound to take place, though perhaps not at exactly the assumed terms of actual life of the individual locomotives:

If two locomotives fail at 10 years and the other two at 30 years, the allowance for replacement by the sinking fund or compound interest methods of computation which are here under discussion would be:

2 failing at 10 years. $2 \times 7.24 = 14.48\%$
2 failing at 30 years. $2 \times 1.06 = 2.12$

Total, required allowance.... $16.60 \div 4 = 4.15\%$

If one locomotive fails at 5 years, one at 15 years, and two at 30 years:

1 failing at 5 years..... 17.39%
1 failing at 15 years..... 3.98
2 failing at 30 years. $2 \times 1.06 = 2.12$

Total, required allowance.... $23.49 \div 4 = 5.87\%$

If one fails at 5 years, two at 20 years and one at 35 years:

1 failing at 5 years..... 17.39%
2 failing at 20 years. $2 \times 2.44 = 4.88$
1 failing at 35 years..... $.72$

Total, required allowance.... $22.99 \div 4 = 5.75\%$

In each of the illustrative cases the average actual life of the four locomotives will have conformed to the predicted probable life of 20 years, but in each case the allowance which should be made to amortize the capital which goes out of use with the locomotives is larger than that which is predicted on the broad, unwarranted assumption that the probable life of locomotives as a class may be made the basis of the calculation.

Stated generally the following is true:

Let r_m , r_n , etc., represent the replacement requirement computed by Sinking Fund methods for an actual service of n , m , etc., years as the case may be.

Let n represent the probable life in years.

Let m represent any number of years less than n .

Then

$$r_{n-m} - r_m > r_m - r_{n+m}$$

From which, $r_{n-m} + r_{n+m} > 2r_n$

Similarly it can be shown that:

$$r_{n-m} + 2\left(r_n + \frac{m}{2}\right) > 3r_n$$

$$\text{and } r_{n-m} + 3\left(r_n + \frac{m}{3}\right) > 4r_n$$

This means that the amortization or replacement allowance for two or more articles having different terms of usefulness should always be larger than the allowances for the same articles if they be assumed to fail altogether at the average of the individual terms. The amortization or replacement if estimated from the probable life new of any article will be too small.

In the practical application of this fact the valuation engineer when called upon to determine how much should be in a replacement fund or how much capital should have been amortized out of the ascertained earnings, will always find himself in trouble. How he will get out of it depends upon the circumstances in each case.

There is some satisfaction in knowing that these and other like difficulties can be avoided in the regulation of rates, if the valuation authorities will have the courage, as they have the right, to adopt some method of procedure under which accrued depreciation need not be estimated. The writer has intimated what this procedure should be and he has fully described it in the various publications already referred to. It need only be stated here that he has named it, the Unlimited Life method, that its correctness is unquestioned, that it does not involve any estimate of accrued depreciation and that the current replacement requirement does not have to be ascertained with more than a fair degree of approximation.

A NEW ELECTRICAL FEATURE OF PORTLAND ROSE CARNIVAL

For the past eleven years the Portland Rose Carnival has been an annual event supported by voluntary subscriptions, principally from the citizens of Portland. These subscriptions became a burden on a few and as the carnival had the hearty support of all the taxpayers in the city, a bill was passed by the last legislature providing for the organization, maintenance and support of Rose Festivals in any county in which there is more than 75,000 inhabitants. The Rose Festival fund must be raised by taxation not to exceed 1/15 of one mill. The county commissioners have complete charge of the funds so raised.

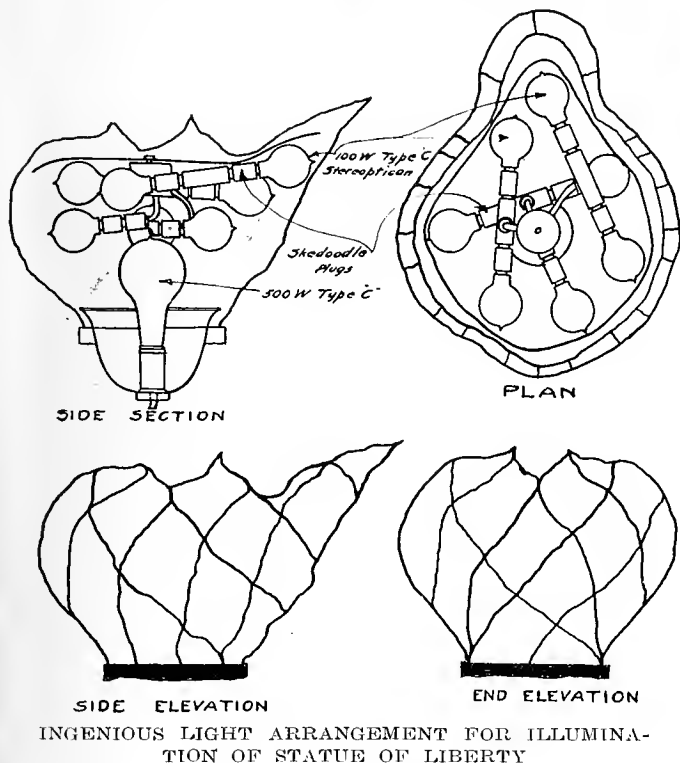
The carnival lasted only three days this year—June 13 to 15, inclusive. Mr. A. C. McMicken, com-

mercial manager for the Portland Railway, Light & Power Company, had charge of the decorations. In the Court of Patriotism there was erected a statue of Liberty, which was constructed by P. L. Fraglió,



THE STATUE OF LIBERTY AT PORTLAND

Here is how the citizens of Portland recently improvised an exact model of the Statue of Liberty in New York Harbor. This beautiful piece of workmanship was then artistically lighted by means of the latest ideas in evolution of illumination engineering. The entire effect served to give the Portland Rose Carnival a tinge of the method electrical that will not soon be forgotten.



mercial manager for the Portland Railway, Light & Power Company, had charge of the decorations. In the Court of Patriotism there was erected a statue of Liberty, which was constructed by P. L. Fraglió,

the total cost erected being about \$2000. This statue was an exact replica of the Statue of Liberty in New York Harbor. The overall height of the statue from bottom of tower to top of torch flame was approximately forty-five feet, built in true proportions. The tower was constructed of "staff" and beaver board built over a strong frame structure. The flame of the

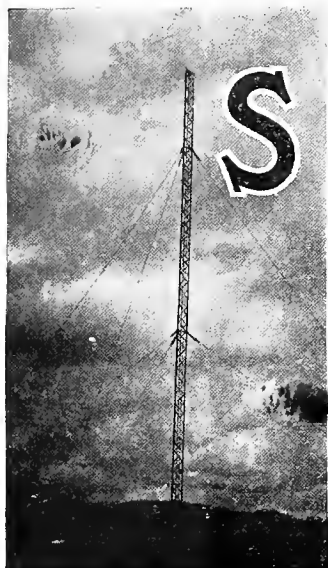
torch was constructed of art glass colored to imitate a torch flame. The glass parts were so fastened together as to withstand wind pressure and the high temperature of the lamps used to illuminate the flame. There was also a cover for the torch flame so as to protect the lamps from the weather, at the same time permitting light to be thrown up to the top of the flame.

This Statue of Liberty effect was only one of many beautiful electrical features that were made possible through the illuminating engineering department of the Portland, Railway, Light & Power Company.

A RADIO STATION IN SALVADOR

BY J. W. FINCH

(Here is a technical description of a recent installation of a radio station in Salvador that has been made by the courtesy of the Mexican government through Mr. Luis Sanchez, the engineer in charge of construction acting under the Director of Telegraphs in Mexico. The article illustrates the immense forward strides that are being made among our foreign neighbors to the south and should be read with widespread interest. The author is a representative of the Journal of Electricity who is making an extended survey of engineering and technical matters among our Latin American neighbors. Since he has had a wide experience in hydroelectric construction in California, he speaks with unusual emphasis for engineers throughout the West.—The Editor.)



Triangular Radio Tower in Salvador

SALVADOR, the smallest of the Central American Republics and at the same time the most densely populated, with its 1,700,000 people occupies an area of but 7,225 square miles. An average of 325 inhabitants per square mile. The country is charming in its scenic variety and offers unusual interest in its seashore, interior lakes, cultivated valleys and wooded mountains. The building and maintenance of good roads is being given considerable attention by the National Government due very probably to the increasing number of automobiles in the country. The Government owned

telephone and telegraph system which extends throughout the republic is quite complete and efficient and offers connection by land wire with Guatemala on the north and Honduras on the south and east. Telegraphic connection with the United States and the world in general is over the cables of the Central and South American Telegraph Company.

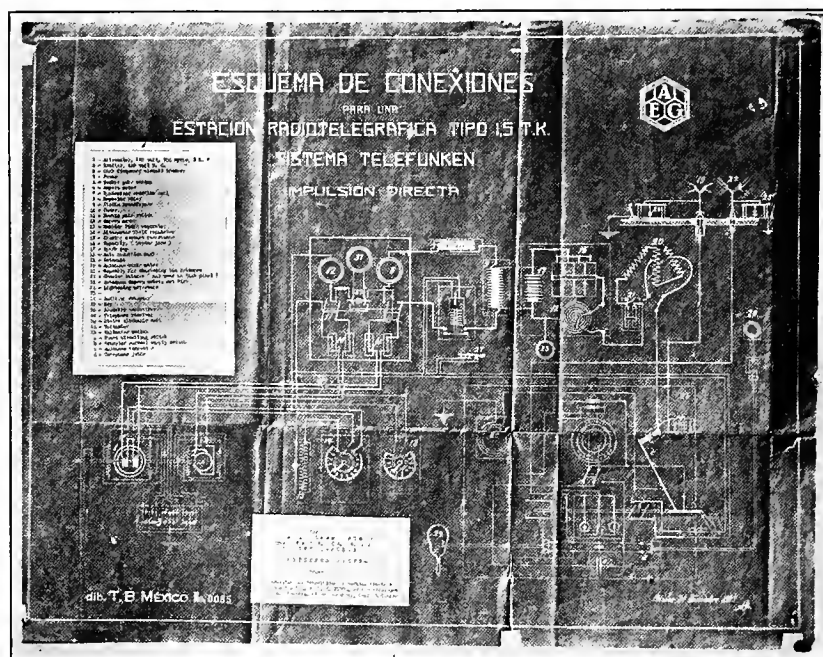
Not many months ago considerable interest was exhibited by the press of the United States, in a wireless station which was reported to be under construction in Salvador. Many conjectures were offered at the time and more or less sensational statements were made as to the capacity and radius of the plant, and too, there seemed to be a great mystery as to its ownership. The writer remembers reading an account in one of our spectacular dailies in which it was stated that "this powerful plant, the property of the German Government," was in daily communication with the German Empire.

Seeing the towers of this station when entering the city of San Salvador prompted an investigation and through the courtesy of Senor Don Luis Sanchez, Inspector del Sistema

Radio-Telegrafico of the Republic of Mexico, who is Director in Charge of Construction of the still uncompleted plant, the writer was permitted to visit the plant and take some notes of the equipment. While the towers and the aerial system are complete and all apparatus is on the site, it will be probably two months from the date this article is written before the plant will be ready for operation.

The system is of German manufacture, the complete apparatus having been graciously presented by the Mexican Government to the Republic of Salvador, agreeing to supply the complete equipment and loan their constructing engineers to supervise the erection if the Salvadorean Government would furnish the site and erect the necessary buildings. With the fine courtesy of the Latin American the apparent sole object of the gift was to still further cement the already very friendly relations existing between these two countries. What further significance there was, or is, in the transaction, if indeed there is any, is best left to the reader's conjectures.

The system under construction is known as the "Telefunken," harmonious extinguishable spark system and it is claimed by the makers to give an efficiency of more than 50 per cent in the relation of pri-



CONNECTIONS FOR RADIO STATION

Here is a diagram of connections for the splendid new wireless system in Salvador, the gift of the Mexican Government. The system is of the harmonious extinguisher type and is claimed to give an efficiency of more than fifty per cent in the relation of the primary current to oscillating current at the antennae. The tower is 60 meters high.

mary alternating current to oscillating current at the antennae. One of the features of the system, with which many American Engineers are no doubt familiar, is claimed to be the arrangement of the spark gap electrodes in which the spark is divided and in which each spark impulse is completely extinguished after a half oscillation of the condenser circuit. Reference to the connection diagram which is reproduced herewith indicates at 17 a series of metal discs which form the spark gap. The regulation of the length of spark required and at the same time the energy consumed is affected by short circuiting the discs, using one disc only for a short transmission and adding discs as required until all are in play for the maximum distance for which the plant is designed. The energy flowing in a reverse direction of the secondary circuit of the antennae to the primary of the transmitter prevents the formation of two different wave lengths.

The arrangement of the spark gap discs precludes the possibility or at least lessens the tendency of the spark to form arcs and facilitates a rapid succession of sparks in the transmitter. With from 500 to 2000 impulses per second in the receptor, a sound is produced which is a pleasing musical tone and it is claimed thereby all foreign noises are completely shut out.

The plant is located in the city proper of San Salvador, but well out from the center of town. Current is therefore available from the lines of the local lighting company, La Compania de Tlumbardo Electrico, and is supplied at 220 volts, 3-phase. A motor generator set is employed consisting of 10 h.p., 220-v., 3-phase, 60-cycle, 1800 maximum r.p.m. variable speed, a.c. motor, belted to a 5 kw., 220-v., single phase, 500-cycle, 1800 r.p.m. a.c. generator. In order to obtain the desired tone the number of alternations is variable between the limits of 480 to 650 per second, by regulating the number of revolutions of the motor generator set. To regulate the excitation of the generator and the number of sparks per second, a resistance is employed by means of which is determined the height and capacity of the tone obtained. A 10 h.p. Otto Gas Engine is installed as an auxiliary to the a.c. motor, so that power is available at all times. The engine is equipped to burn petroleum or the lower grades of distillates and it is so arranged that it can be connected very quickly with the generator in case of an interruption to the city current supply.

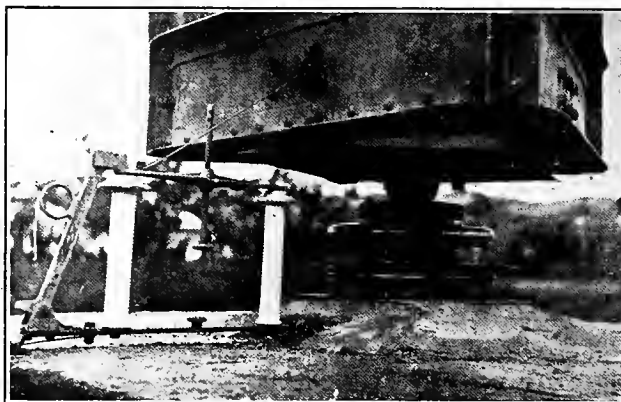
The transmitter current passes from the generator through an oil immersed transformer where it is transformed from 220 volts to 8000 volts. In the primary circuit of this transformer is connected a reactance coil which serves to effect the resonance between the transformer and the excitation circuit. The excitation circuit is composed of 4 Leyden jars having a capacity of 10,000 c.m., the spark gap consisting of 12 parts or discs and an auto-induction that consists of a spiral band of copper, from which is taken various taps, provides a means of varying the oscillations of the circuit within certain limits.

The station is designed for syntonization for wave lengths of 600, 900, 1200, 1650, and 2000 mt. To syntonize the antennae with the excitation circuit a mechanism is provided for figuratively lengthening the

antennae. This apparatus consists of five spiral coils mounted in a fixed position on a shaft. Taps are provided so that any number of coils can be connected to the antennae and in that way obtain the desired wave length.

The antennae of this plant is of the common T shape and has a capacity of 2000 c.m. It is suspended between two triangular steel masts each 60 mt. in height and 100 mt. apart. An unusual feature of the mast construction is the fact that the mast is effectively insulated from the ground by means of a large built up glass insulator at its base, as shown in the accompanying cut. Each steel tower weighs in itself over seven tons and adding to that weight the pull of the 8 guys consisting of one inch steel rods, the weight of a tower on the insulator is probably 25 tons. The guys are also insulated, having glass discs set in a turn-buckle near their lower end. A lightning arrester is shown in the photograph also with its adjustable gap and disconnecting switch.

The receptor is arranged with several telephone circuits so that more than one person may receive at the same time, and its range is for wave lengths from 220 to 4000 mt. The transmission range of the plant under favorable atmospheric conditions is, during the day 450 kilometers and during the night up to 1000 kilometers, these distances being possible for free sea transmission including not more than 10 per cent of clear land. For land transmission the distance is



Huge Glass Insulator at Base of Tower

considerably less as the vegetation here is very dense and there is heavily wooded territory to pass, on practically all land sides. The land distance during the day is 400 kilometers and during the night up to 700 kilometers. Under exceptionally favorable atmospheric conditions perhaps any of the distances mentioned could be increased a little but for all practical purposes they indicate the limits of the plant.

Government Nitrate Plants to Be Rushed.—Secretary of War Baker has made brief announcement that Government plants for the electrical fixation of atmospheric nitrogen are to be erected and placed in operation at the earliest possible date. It is expected to spend about \$4,000,000 for this purpose out of a total appropriation by Congress of \$20,000,000. Mr. Baker stated that the plans now being worked on would not involve new water-power developments on account of the length of time required for the erection of hydroelectric plants.

CONCLUSIONS ON HEAT INSULATING MATERIALS

BY JOHN CRAWFORD, Jr.

(Electric water heating constantly demands an increasingly closer attention to the materials used in heat insulation. Here is an article that concludes a valuable series of three papers on this subject that have appeared in the issues of the Journal of Electricity for July 15, 1917 and Aug. 1, 1917. In this article the author, who is head of the asbestos and magnesia department of the H. W. Johns-Manville Company at San Francisco, concludes his treatment of this subject by a discussion of the efficiency of a number of commercial insulation materials on the market. A table of thermal conductions of various insulation materials together with a valuable bibliography on the subject of heat insulation is appended, and finally follows the stenographic report on the subject of heat insulation that took place at the Riverside Convention of the Pacific Coast Section, N. E. L. A.—The Editor.)

The endeavor of the foregoing paper has been to clearly point out that to maintain in an uninsulated or inefficiently insulated condition any hot surface from which the heat loss represents a loss of fuel or decreased efficiency, is a wasteful extravagance.

The use of insulation which is not properly designed, or so proportioned in thickness as to give maximum economical return on investment, is not excusable, in this day when all necessary data to guide one, is available. In general, the insulating efficiency of the various commercial non-conducting materials increases in more than direct ratio to their increase in cost. Hence, the purchase of the cheaper types of commercial insulation is false economy from two standpoints. First, because of their lower insulating value, and second, because usually the design of cheaper forms of insulation is such that they have not the durability of the more efficient types—i.e. their initial insulating value cannot be considered as being permanent.

In traveling from one point to another, heat, like electricity, chooses the path of least resistance to its flow. Since confined air offers the highest resistance to heat flow, manufacturers endeavor to take advantage of this fact in designing heat insulation. How permanently efficient, the resulting insulation really is, depends:

First: On how closely the air is confined to avoid losses by convection.

Second: On how poor a conductor of heat the material confining the air is.

Third: On whether the flow of heat must cross the confined air or if the greater part of the flow is around it. In the latter case the efficiency of the insulation depends on how devious this path is.

Fourth: On whether continuous expansion, contrac-

tion and vibration of the surface on which the insulation is applied will gradually cause the insulation to crack or revert to a powder on the inner surface, thus facilitating convection currents between the hot surface and the insulation.

Fifth: Whether the chemical composition of the insulating material is such as to be affected by long continued action of heat.

Chart No. 2¹ which is one of the most valuable recent contributions on heat insulation gives for a temperature difference range up to 700° F., the heat loss from bare, black, iron pipe in B.t.u. per square foot per hour, for each degree F. temperature difference between steam and air and the heat loss from the pipe when insulated with 1-inch of various types² of commercial pipe insulation. These tests were made on a standard 5-inch pipe. Hence, the results are not strictly accurate for pipe insulations greatly larger or smaller, but as 5-inch is about an average size of the piping in any plant, the errors will tend to compensate each other.

A survey of this chart indicates how rapidly the heat lost from bare pipe increases as the temperature difference becomes greater. As has been previously pointed out, the heat transferred by radiation from the surface of the pipe and by the convection currents of air surrounding the pipe increases in geometrical ratio to the difference in temperature. The thermal conductivity of the steel itself also becomes greater as its temperature increases.

Now let us consider the six typical forms of high temperature insulation in order.

The insulating value of air cell is very poor, even at low temperatures, and its relative insulating value decreases as the temperature differences becomes greater. This is because its structure of longitudinal channels of poorly confined air facilitates losses by convection currents.

In asbestocel insulation, the channels of air run transversely and are much smaller than in air cell. Hence, its insulating efficiency is much higher at all temperatures. But, since the air which it encloses is free to circulate, there are appreciable convection losses through the two longitudinal cuts in the covering. The curve shows that like air cell these convection losses become greater as the temperature difference increases.

The plastic magnesia curve does not indicate any loss by convection. The losses are greater than in magnesia pipe covering because, as applied in plastic

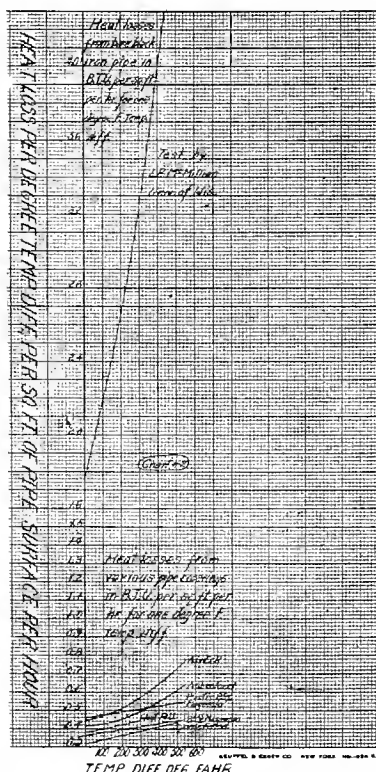


Chart No. 2. The Heat Loss from Bare Black, Iron Pipe in B.t.u. per Sq. Ft. per Hr.

¹ Abstracted from "Heat Insulating Properties of Commercial Steam Pipe Coverings" L. B. McMillan (Trans. A. S. M. E. Dec., 1915.)

² McMillan also tested many other makes of coverings of these types.

form, magnesia is denser and contains less confined air, and because, in drying out rapidly on a steam pipe, it shrinks, and is traversed by small cracks.

The heat retarding principles taken advantage of in wool-felt are technically correct. The structure of the felt is such as to cause the heat travel by conduction to follow a circuitous path and between each layer of felt there is a film of air, across which the heat is forced to travel. Wool felt shows no convection losses. That it does not show higher efficiency

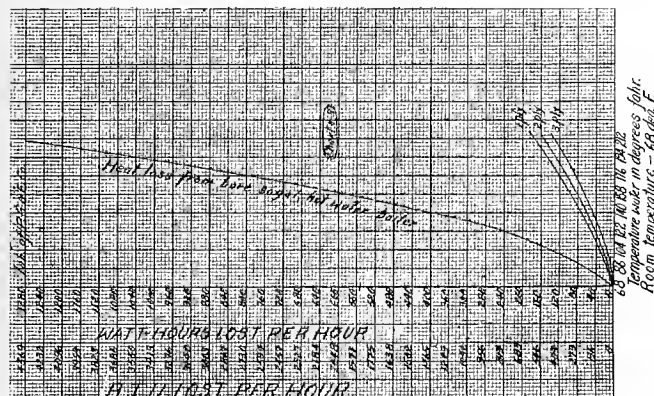


Chart No. 3. B.t.u. Loss per Hour for Domestic Hot Water Tanks from a 30 gal. Tank Insulated with an Economy Jacket

is because ordinarily there are only about twenty layers of felt used to the inch—with twenty intervening films of air. As wood felt is organic material, its use is limited to low temperatures.

The efficiency of 85 per cent magnesia insulation is due to the fact that hydrated carbonate of magnesia ($4\text{MgCO}_3 \cdot \text{MgO}_2 \cdot \text{H}_2\text{O} \times 5\text{H}_2\text{O}$) contains per unit of volume a very large proportion of air confined in very small particles, and to the fact that the material itself is a very poor conductor of heat. The easier path for the heat flow is by conduction through the magnesium carbonate and around the air pockets. Hence, the greater amount of the heat flow will be in this way. To escape thus, the heat must travel a long circuitous path. The limiting factor to the efficient use of 85 per cent magnesia pipe covering is the fact that its high initial insulating value cannot be considered to be permanent at high temperatures. From its composition, it will be noted that it consists of carbonate and hydrate of magnesia with a relatively large proportion of chemically combined water. This chemically combined water will be driven off quite rapidly at 500°F . and more slowly at lower temperatures. This breaking down in structure will be augmented by expansion and vibration of the hot surface, and a channel of unconfined air will be formed between the hot surface and the insulation. Heat losses by convection will result.

As the chart indicates, asbesto-sponge felted has the highest efficiency of any commercial insulation. Since its design takes into consideration the laws of heat flow in the most technically correct manner, it is logical that it should be. Asbesto-sponge felted insulation is composed of 40 sheets to the inch of a loosely felted asbestos material in which are incorporated fine particles of ground sponge. Both asbestos fibre and sponge are very poor conductors of heat and by making them into a loose felt, a large

amount of confined air is enclosed. This causes the flow of heat to follow a devious path through the felt. Between each two layers of this felt is a film of confined air, which is the slowest conductor of heat known. In the case of these films of air there is no path for the heat flow to get around them, hence, it must pass across them. As there are forty of these films of air to each inch, it will be apparent that the rate of heat flow will be enormously retarded thereby.

Since asbestos does not lose its water of composition below 1000°F . and since the percentage of the organic matter (sponge) is small, asbesto-sponge felted insulation can be considered to be permanently efficient at the highest temperatures of superheated steam.

Charts Nos. 3 and 4 refer particularly to the insulation of domestic hot water tanks. Where gas or electricity is used as the source of heat, the economic efficiency of the insulation used to retard the heat losses from the tank is generally the limiting factor which determines the success or failure of the installation. But, even where cheap forms of fuel are used the domestic enjoyment of always having an abundant supply of hot water more than compensates for the investment.

The economy range boiler jackets which use as their insulating medium hair felt, are highly efficient, easily applied and moderate in price.

Sil-O-Cel is a good insulating medium per se but its use is limited to conditions where it is feasible to build a box around the boiler to contain it.

Obviously, the proper heat insulation to use is that which will give the highest permanent return after the initial investment has been amortized, and the author trusts the foregoing paper may be of some assistance in making the proper selection.

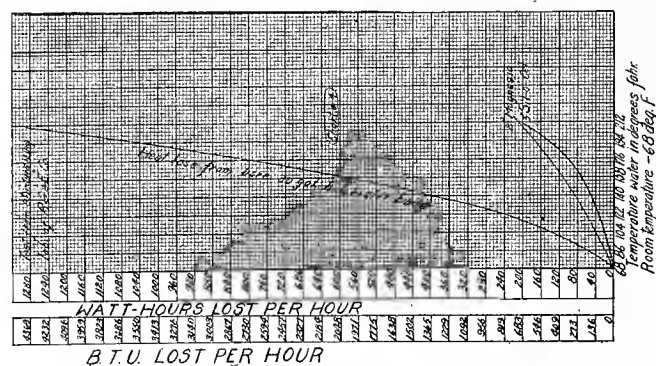


Chart No. 4. B.t.u. Loss per Hour for Domestic Hot Water Tanks from a 30 gal. Tank Insulated with Magnesia and Sil-o-cel

Thermal Conductivity of Insulating Materials

(C. P. Randolph, Research Laboratory, General Electric Co., Great Barrington, Mass., 1913.)

Material	Weight, lb. per cu. ft. as Tested	Thermal Conductance per sq. ft. per in. thick, per hr., per Degree F. Diff.	0.191 B.t.u.
Dead air	.06-.08	0.33	"
Asbesto-sponge felt	34.40	0.345	"
Cattle hair felt	8.49	0.455	"
85% magnesia blocks	13.50	0.479	"
Mineral wool	26.60	0.526	"
Diatomaceous earth and asbestos	20.7	0.546	"
Pure loose asbestos	12.5	0.693	"
Asbestos corrugated paper	15.6		

(By Union Pacific Railroad, for Standard Car Committee, Omaha, 1914)

Material	Weight, lb. per cu. ft. as Tested	Thermal Conductance per sq. ft. per in. thick, per hr., per Degree F. Diff.	0.251 B.t.u.
Cattle hair felt	10.53	0.274	"
Pure cork board	14.98	0.305	"
Lith	24.50	0.331	"
85% magnesia	25.53		

(By C. P. Paulding, 1910)

Cattle hair felt	0.32 B.t.u.
Mineral wool	0.38-0.47 "
Pure sheet cork	0.47 "
(Miscellaneous Authentic Sources)	

Hair felt	0.40 B.t.u.
Sheet cork	0.50 "

Efficiencies of Different Sectional Insulations at Various Temperatures

(Tested on 5-inch Standard Pipe by Prof. L. B. McMillan)

Kind of Covering	100	Temp. Dif.	Deg. F.	400	500
Asbesto-sponge felted.....	83.8	86.2	88.0	89.8	91.5
85% magnesia (A)	82.3	85.0	87.3	89.4	91.4
85% magnesia (B)	80.5	84.1	86.6	88.8	90.9
Diatomaceous earth and asbestos	81.3	84.6	86.9	89.0	91.0
Asbestocel	80.0	83.0	84.8	86.5	88.2
Serrated	78.2	81.0	83.3	85.4	87.8
Air cell (A)	77.9	80.7	82.7	84.1	85.8
Air cell (B)	75.0	78.3	79.1	80.9	83.1
Wool felt (A)	81.4	84.2	86.4	88.4	90.4
Wool felt (B)	80.9	83.8	85.9	87.9	89.9
Plastic 85% magnesia.....	78.2	81.6	84.5	87.1	89.5
Fire felt	67.0	71.9	75.6	79.0	82.6
Vitribestos	69.6	73.2	76.0	78.8	81.4

Bibliography

- "Heat Conductances Through Walls of Furnaces," Trans. Am. Electrochem. Soc. vol. xiv (1908), p. 215.
 "Heat Conductance and Resistance of Composite Bodies," Electrochem. and Met. Ind., vol. vii (1909), p. 11.
 "Heat Conductivities in the Calculation of Furnaces," Electrochem. and Met. Ind., vol. vii (1909), p. 72.
 "Thermal Resistance and Conductance; the Thermal Ohm and Thermal Mho," Met. and Chem. Eng., vol. ix (1911), p. 13.
 "The Flow of Heat Through Bodies," Met. and Chem. Eng., vol. ix (1911), p. 652.
 "Flow of Heat Through Contact Surfaces," Met. and Chem. Eng., vol. x (1912), p. 40.
 "The Thermal Insulation of Furnace Walls," Met. and Chem. Eng., vol. x (1912), p. 97.
 "Effects of the Variations of Thermal Resistivities with the Temperature," Trans. Am. Electrochem. Soc., vol. xxi (1912), p. 511.
 Data by F. T. Snyder, Am. Electrochem. Soc. xvii, (1910), p. 239.
 Data by Carl Herring, Met. and Chem. Eng., x (1912), p. 41.
 Trans. Am. Soc. M. E., vol. 5, p. 73; vol. 5, p. 212, vol. 6, p. 168, Trans. Am. Soc. M. E., vol. 19, p. 729.
 Mathematical Theory of Heat Conduction, by Ingersoll and Zobel.
 Richards "Metallurgical Calculations," vol. i, p. 179.
 Fitzgerald, "Experiments in Heat Insulation," Am. Electrochem. Soc., (1912), vol. xxi, p. 535.

ERRATA: In the issue of the Journal of Electricity for Aug. 1, 1917, a typographical error appeared in the closing paragraph of the article on Types of Practical Heat Insulation by John Crawford, Jr., on page 116. The paragraph should read:

The list price of 2-inch thick Asbesto-Sponge Felt Sectional Insulation for 12-inch pipe is \$2.70 per lineal foot and for 1-inch thick \$1.85. The increased cost of using 2-inch thick insulation over 1-inch thick is therefore 85c per lineal foot. The increased fuel saving is 0.007 lbs. of oil per foot per hour.

Assuming oil to be worth \$1.25 per bbl. of 336 lbs. or \$0.0038 per lb., the increased fuel saving per hour is \$0.000266 per lineal foot. Hence, to pay for the difference in cost between 2-inch thick and 1-inch thick insulation, it will take

\$0.85

\$0.000266

= 30195 hours = 41 months.

Since the additional investment is amortized in 3½ years by the increased saving, the economy of using the thicker insulation is apparent.

RIVERSIDE DISCUSSION ON HEAT INSULATION

John Crawford, Jr.: I have prepared a brief synopsis of the subject.

The impression conveyed by the various speakers who have preceded me is that you all have one ultimate aim in view, and that is Service. You all seem to want to give to your consumer the greatest number of B.t.u.'s. for the least possible price and still be able to make a profit for yourselves which is commensurate with your investment and which justifies you in taking the business and in giving the consumer those B.t.u.'s. One of the best ways of accomplishing this is to conserve for the consumer the greatest possible number of those B.t.u.'s. for the service for which they are intended.

I really believe it will be distinctly to the advantage of you men to make a serious study of heat insulation. For instance, you should know, if you do not already know, why it is that if you put 1 in. of a particular form of insulation that I have in mind on a 1 in. pipe carrying steam at 150 lb. pressure, it will show a heat saving of approximately 80 per cent of the heat which would be lost from the uncovered pipe and if you put 1 in. of the same insulation on a 12 in. pipe, it would show a heat saving efficiency of almost 89 per cent. I believe you should also know that the cost of insulating with that particular form of insulation per square foot of

surface on a 1 in. pipe is approximately 79c, and on a 12 in. pipe only 55c. You should know that the basis on which the value of heat insulation should be computed is really not per square foot of radiation surface but per unit of internal heat volume. That is, after all, what you are trying to do to conserve a certain volume of heat in the hot water tank. Manifestly, the greater the volume you can get for any given square foot of radiation surface, the more efficiently you can insulate it. These points do not seem to have been given the consideration they deserve and the fault, I believe, is not with the engineering profession. To a great extent, the fault lies with the manufacturers of non-conducting materials. They have made extravagant and unsubstantiated claims for their non-conducting materials and they have failed to indicate under what conditions of service their materials should be used to give the greatest efficiency. For example, you can take a specific type of insulation and apply it to a hot water line and it will show you, say 85 per cent efficiency. If you apply that same type of insulation under another condition of service it may show you 80 per cent efficiency, or it may show you 90 per cent. For every particular condition of service there is a type and a thickness of insulation which will show the highest permanent return on the investment.

In conclusion, I simply want to say that for insulating hot water tanks, which is what we have had principally in mind here, today, you have at least three distinct conditions to consider.

First: It would seem you want a high heat insulating efficiency.

Second: You want a type of insulation that will show maximum efficiency for the thickness of insulation used when applied by the same mechanic who installs the electric heater.

Third: It would seem to me you want a type of insulation which can be shipped in a convenient package, all in one piece. This seems to be especially true where electric heaters are shipped out into country districts.

Chairman S. V. Walton: Mr. Crawford has prepared this treatise on the subject and has made a number of copies. I want to speak for one of the copies myself. We can have it printed in the record, if you will turn it over to the secretary. There is one other man in the room that I promised to call on to speak from the same general point of view—insulation and water heating in general—Mr. Morris of the Westinghouse Electric & Manufacturing Company of Los Angeles, who has had considerable experience on that subject.

J. M. Morris: Gentlemen, Mr. Crawford has covered the ground in his remarks, but I want to emphasize an important detail in connection with the art of heating water by electricity. Efficiency is necessary. There are two kinds of heater. In one case the element is in the tank. The other is a circulation type. It is an instantaneous heater and is exterior to the tank. In my study the heater itself should be lagged. I notice that in all cases where the circulation pipe is on the outside of the tank, the heater is out in the open. The temperature of the heater is very high and the radiation is considerable. There are some types on the market that take care of that by putting the heater within the lagging. I think that ought to be considered carefully in connection with this water situation when you realize at 2 cents the cost per gal. is a quarter of a cent for hot water, and that the consumption of a family of about four people, that is, two grown people and two children, is apt to run approximately thirty gallons a day, in cases where they do their own washing, or between 900 and 1200 gallons per month. You must realize this lagging question is a most important one.

Chairman: I might mention the tests made in our laboratory which indicate that under the ordinary conditions the losses in the heater,—approximately 8 ft. of circulation pipe—the losses were approximately 50 per cent as great as the losses in the entire boiler itself, showing the necessity of covering up the heater and saving that heat.

THE PLOT IN ADVERTISING

BY H. A. LEMMON

(Here is an excellent article on the plot that must underlie successful advertising matter sent out to set forth in the local papers the usefulness that electricity and electrical appliances have for the household. Mr. Lemmon is salesmanager for the Reno Light & Power Company of Nevada and is a well-known figure in the upbuilding of the electrical industry in the West. The paper was delivered at the recent Santa Cruz Convention of the California Association of Electrical Contractors & Dealers. In this article the psychology of advertising is set forth while in the next issue of the Journal an extremely useful chart for applying the psychological principle will be given.—The Editor.)

I conducted a toaster campaign—not so many years ago—in which I used large space in the daily papers, showing beautiful pictures of the device, and gave many scientific reasons why electrically made toast was superior to others—as in fact it is. Much of that advertising copy was prepared by one of the highest paid advertising experts in the United States, and was elaborately decorated with such cleverly descriptive words as “crunchy,” “dainty crispness,” “golden brown,” “delicate flavor,” etc., until as I read it over and planned the other details of my campaign my mouth would water and I had to wear a napkin in my office to save the desk pad. I soon realized that my supply of toasters would never survive the first ad, and so wired a rush order for another 100. Just my natural conservatism kept me from making it 200. I convinced the manager that if he would keep his hands off I would show him something, and opened up with half-page spreads. Well, when the ten-day advertising campaign was concluded we had sold about twenty toasters for \$3.50 each and the advertising expense was exactly \$27.80 per toaster. It seemed to occur to me that advertising doesn't pay.

A few weeks later I tried it from a different angle and sold close to 100 toasters at an advertising expense of 32 cents each. Apparently advertising does pay—sometimes.

But to go back to the first campaign. It dawned upon me that this little matter of advertising was worth looking into if I expected to remain “among those present” on the pay-roll. The first obstacles encountered were the theories of some of my friends who are professional ad writers. They told me no one could foretell the result from any certain series of retail advertisements. They've told you the same thing until perhaps you believe it. Some of them will prove it if you let them write the ads. The next time any ad man tells you that sand-bag him and while seated on his chest tell him gently but firmly that any such uncertainty in result is due to the writer of the ad, and to him only. If you tell him that there should be no more difficulty in approximating the cash returns from any given series of advertisements for our goods than the United Cigar Company has in determining in advance the probable sales of a new store, he is going to look into your eyes to see if you really mean it, and finding you do is likely to edge off to a place of safety and probably report you to the first policeman he meets.

And yet I stand here a stranger and unarmed and assert to you that you can do exactly that thing; and further

That any one of you can write as good a retail advertisement as can the expert—with a fair chance that it will be better; and still further

That retail advertising is not an art. It is not a mystery. It is an exact science, based upon very simple rules.

Advertising may be used to accomplish so many purposes that a consideration of them all would occupy the entire time of this convention.

For example there is the one of creating good will. Some advertisements are designed to mold or change public opinion, and so on; but we will confine ourselves to retailing electrical goods. And please bear in mind all the while that for many years the world jogged along very comfortably without the electric devices we so very much wish to see introduced into every household. Therefore insofar as advertising them is concerned we will do well to treat them somewhat as we would luxuries, however cleverly we may conceal such treasonable thoughts.

What usually happens when one of us starts to write an advertisement to sell electric ranges, for example? Most of us will look through a collection of the manufacturers' booklets and endeavor to include all the points of excellence we find there. In other words we try to sell electric ranges.

Now it so happens that there isn't anyone in our whole world who wants to buy an electric range. And there are hundreds—perhaps thousands of women in my territory who are suffering for better cooking methods. That is they are longing—perhaps unconsciously—for some of the things an electric range will give them. So instead of trying to sell them electric ranges we will sell them some of the things an electric range will accomplish, and we will write and talk very little about the range itself and a great deal about these things.

Fortunately advertising is one of the very few undertakings of which perhaps we can tell what to do, easier than what not to do.

Advertising to men or women familiar with, and already interested in an article is one thing; interesting them in an article with which they are more or less unfamiliar, and don't believe they need, is another. Advertising to purchasing agents, engineers, central stations, contractors and dealers is advertis-

THE PSYCHOLOGY OF SALESMANSHIP

“If you wish to sell to me an article for my own use that every day necessity doesn't demand, you must lead me to form a picture in my mind in which I and the article itself form the principal parts, and the picture must be one in which I seem to be deriving great benefit and pleasure from possession of the article.”

ing the article itself. That is the manufacturer of a device, which he wishes you to handle, usually devotes his space to making you acquainted with it from the standpoint of its reliability, its novelty, its saleability, etc. He speaks much of the article itself.

Having stocked it and desiring to sell it rapidly we likewise contract for newspaper space and tell the people about it. But our method should be far different from that of the manufacturer. While he dwells upon the mechanical perfection of his suction cleaner, for example, with a paragraph or more about its motor, and another about its fan, etc., in his endeavor to sell to us; we exactly reverse his methods—that is if our advertising is to give profitable returns. We tell the people little or nothing about the device itself and a great deal about what it will do for them in their hands and in their homes. In other words we purchase a device, but sell a service. If we can remember just that one point we will have laid the foundation for a successful advertising or selling campaign, and almost instantly have become expert retail salesmen.

It isn't necessary for you to tell me that I am no brighter than you are. I admit it; and so I am going to tell you how I escaped the conclusion that advertising doesn't pay, and also managed to keep a clutch on that job.

After the tragic returns of that toaster campaign were all in I spent some two or three sleepless nights deciding on just the form of resignation I should send in and speculating as to whether I would be allowed to present it before being fired.

Of course my wife noticed this despondency and commented on it and endeavored to learn its cause. I finally informed her—just in the manner you would go home and tell your wife you had been caught stealing the neighbor's lawn mower. Incidentally we had a small boy in our house. Wife was very sympathetic over that toaster campaign failure of course. It was a shame, but the boy had gotten a hundred in spelling and 95 in language and 90 in school deportment and wasn't it just wonderful.

I remarked that quite possibly our boy would have to leave school and get a job as messenger or something of that sort to keep the wolf from chewing off the doorknobs.

"Uh, huh," and if our boy acted like that Jones boy next door she would spank him until he never would want to sit down again. Well, it was unusual, but I really did have a thought. I learned something that every one of you always knew; that the female of the species—any species—first thought and deepest interest is for her offspring. That to a normal mother her children are about all in the world that is really essential and almost everything else is just ornamental, or incidental as it were. Of course I always knew that also—just didn't have wit enough to cash in on it. Reach the mother through her heart interest. Likewise it eventually penetrated that most of the ladies to whom we can sell are mothers. Those who are not have other interests nearly as useful to us for our purposes.

So I went to work jotting down reasons why various women should be considered eligible pros-

pects for electrical devices. I soon found that a surprisingly small number of words included every probable buying motive—just as many have found before. The next thing learned was that these same reasons for purchasing applied to any article which might be offered for sale. Also that all of the ladies of my acquaintance could be classified into extremely few groups and pretty soon a chart suggested itself.

What is necessary to accomplish a sale? Just one thing. If you wish to sell to me an article for my own use that every day necessity doesn't demand, you must lead me to form a picture in my mind in which I and the article itself form the principal parts, and the picture must be one in which I seem to be deriving great benefit and pleasure from possession of the article.

The second toaster campaign dismissed the device itself and the fact that it made toast in one sentence; and instead sought the appeal in other sources. First, ostensibly in the little daughter of the household. She could make toast for daddy at the breakfast table. The idea pleases the little girl, and a little girl is an influential member of any household. Every father is proud and happy to have his little daughter take on grown-up duties when they are expressly and exclusively for him. He is likely to boast of it if anyone will listen to him. So it works both ways. Another ad of this series was for the mother. Her little girl could share the responsibility of preparing the breakfast. Also a double purpose—as you will observe.

I wish particularly to call your attention to the difference in the two campaigns, for I wish to speak of the principles underlying this one a little later on. The appeal to the father, mother, and daughter herself, was a story with a plot. The advertisements regarding the excellency of the toast, the rapidity and beauty of the toaster had no plot. The stage was all set, but we didn't bring in the actors. It consisted of nothing but scenery. A story without a plot isn't much of a story. Neither is an advertisement without a plot much of an advertisement.

That plot we are talking about is for nothing more or less than to create a mental picture. No plot, no picture. No picture, no sale.

There isn't a man attending this convention who wants to buy a doll right this minute, and probably not one who would buy if I offered some for sale. It quite likely wouldn't increase my selling chances any if I explained to you that my dolls had real eyelashes, or real hair, and moving arms and could cry; but if I had the power of words to force you to paint a picture in your own minds of the joy and the pleasure—the widening eyes—that would come to some little girl of your acquaintance, every man of you would buy one of my dolls, because the mental picture you would have formed of the happiness given to that little girl constitutes a real selling plot.

However if you were little girls, instead of men, I would have only to mention the word "dolls" and every little feminine mind of you would immediately furnish its own picture out of the abundance of its imagination and would weave around each of the specifications of real eye-lashes, movable limbs and so

forth, a veritable fairy plot. So we see that plot building in our advertising must consider the view point of the one to whom we are making plea. Undoubtedly some advertisements without plots sell good such as we are interested in, because some of our readers are imaginative enough to paint their own mental picture without our suggestions, just as do lit-the girls when they see the word dolls. But grown-up people are not generally imaginative to any degree in the ordinary affairs of life.

Another illustration. If one of you is suffering the excruciating pain of a good healthy corn between two toes—a non-union corn that revels in long hours, a corn that is enthusiastic and stays on the job—all that is necessary to gain your closest attention is the word “corns.” Your own imagination and experience supply the plot. Yet if we were advertising a preventative of corns and wished to reach the man with healthy feet the word wouldn’t impress itself upon his mind to any extent whatever, and even though it might appear in large type in a choice position in his favorite paper he probably would not be conscious of having seen it. In the latter case we would have to write to stimulate his imagination until his mind pictured the plot—the agony of a corn—and he would be aroused thereby to spend money and take time to guard against something which we will have taught him is painful.

Still another: Whichever way we turn we are confronted by the cryptogram “57.” We don’t require anyone to tell us that it refers to a famous manufacturer’s pickle products. Standing by itself it means nothing. And yet probably each one of us unconsciously forms a fleeting mental picture of some of these products whenever we see the two figures. In the newspaper and magazine advertising which has gone before, Heinz has interwoven many plots. We read of the immaculate condition of the factory itself; how the girls’ hands are manicured each morning before going to work, and their clothing cared for with hospital exactness. Our confidence is gained by inviting us all to visit the factory where these wonderful pickles and condiments are produced. Again we are led to picture their deliciousness by description of the ingredients, written with a skill calculated to tempt the appetite, until we determine that our very next purchase in that line shall be one of the famous “57” varieties. So persistently have all these details been impressed upon our minds by the printed advertisements, and so persistently have they become associated in our minds with “57” that we unconsciously and invariably merge the two ideas, and it requires but the numerals to bring up the entire picture again—to furnish the plot; just as the word “dolls” does to the little girl, or the word “corns” to the sufferer.

Now we must bear in mind that in principle at least our ads should be written to sell dolls to men; corn-preventative remedies to men who have no corns; and pickles which have not already been made famous.

Perhaps you’ve noticed the sudden awakening among the book publishers. Everybody knows that a novel is going to contain a girl—The Girl—and a man, who finally proves to be The Man, together with some hand-picked difficulties; but all at once the wise men who market these diversions are really saying some-

thing in their ads. Pick up any magazine and you will find half a dozen book advertisements which, while more or less alike, really make personal contact with the reader. Usually there is a picture of a girl sitting on nothing in particular, and dangling her legs, which are decorated with silk as far as possible—and that is quite a way. Then we go on something like this—

“Unhand me Villain”

Said the beautiful shop girl. “I hear the sound of approaching footsteps on horseback.” She was just an unspoiled country girl and he—he was a man of the world, wealthy and accustomed to having his way with such as she. He had found her poised on the river bank, a bottle of cyanide in one hand, a revolver in the other. Then there was the boy from home, but—

Now you know right away whether that book is going to appeal to you or not. If you like that sort of a story you will buy it, and if you don’t you wouldn’t have bought it anyway, from merely seeing its title, the number of pages, the quality of the paper and the price. It is a fine example of personal contact, or human interest as the newspaper boys would say—and every one of us may learn much by studying it, for it is an advertisement with a selling plot. If the moving picture people ever learn how to advertise they will soon have all the money in the world in their coffers.

AN INSTANCE OF THE REWARDS OF THE ELECTRIC PUMP

In a recent issue of the Pacific Service Magazine an interesting description of the Yolo District of the Pacific Gas & Electric Company is set forth. The notable feature is the strong aid that is being rendered to agricultural production by the electrical pump, which is typical of hundreds of other districts throughout the West.

In this instance about twenty thousand acres have been added to the available land in California by means of a battery of six 800 h.p. pumping units installed in Reclamation District No. 1500 pumphouse in the Sutter Basin. This district, comprising fifty-five thousand acres, is being reclaimed, but up to the present time the leaves have not been entirely completed. The flood water from the Sacramento and Feather rivers spreads over a greater part of the land in winter. In summer, when the rivers drop, a lake is left covering about twenty thousand acres. To drain this land the electric pumps are started and are run night and day until the entire area is drained. Each pump has a capacity of over seventy thousand gallons per minute, and the entire plant has a capacity of approximately 600,000,000 gallons per day, or enough water to supply the city of San Francisco for about fifteen days. It is said to be the largest reclamation pumping plant in the world.

This very fertile land produces a wonderful yield of various kinds of beans. During the latter part of June, after the pumps have finished draining the land, a small army of farmers with traction engines and farming implements of all kinds start to plow and plant the land to beans. The average yield will be close to fifteen sacks per acre and in this section alone the crop will be worth approximately \$5,000,000.

SIZE OF SERVICE WIRES FOR A GROUP OF MOTORS

BY F. D. WEBER.

(The question of feeder sizes is an important question and one which has been treated little in the technical press and text books. This article treats this subject as applied to motor installations and evolves a method original and practical, whereby an immense amount of money can be saved by the owners when installing new motor equipment and at the same time satisfy the requirements of the most exacting inspection department. The principles involved are based upon sound engineering considerations. The author is electrical engineer for the Oregon Insurance Rating Bureau.—The Editor.)

The proper size of service wires for one squirrel cage induction motor and one direct current motor is definitely established by Rule 8 (c) and Rule 8 (d) of the National Electric Code, Edition 1915, but confusion arises as to what the proper size of mains should be when there are more than one motor connected to the same mains.

The following methods are based on the supposition, that the smaller motor, if only two are involved in the installation, or all except the largest one might be running at the full load, then the largest one of the group would be started. The probability of the starting of all the motors at the same time is quite remote and not very often encountered. When the number of motors increases a likelihood of the starting of all the motors at the same time becomes more remote, but if it is definitely known that more than one motor in a group will be started at the same time, then the starting current of all such motors must be considered. In the absence of a definite diversity factor, being known, we can proceed as follows: If two motors of relatively small horsepower are to be considered, we have several methods to determine the size of mains now used in various sections of the country.

Considering alternating current motors only:

For example, two motors being 220 volts, 3-phase, 60-cycle constant speed, squirrel cage type, induction motors, started by means of standard auto-starters and wired on a system in which starting and running fuses or equivalent protection is installed for each individual motor, motors being of 5 and 10 h.p. respectively.

Method 1. Under rule 8 (c) last paragraph a table is given for current carrying capacity of wires to be used with a.c. motors, based upon the full load current of the motors as follows:

Rated full load current.	Percentage
0-30 amperes.	250
31-100 amperes.	200
above 100 amperes.	150

Therefore, taking the full load current of the smallest motor, plus the starting current of the largest motor based upon this table, we get the total current necessary to start the largest motor when the smallest motor is running at full load. Then by Rule 8 (c) fifth paragraph, the following is stated:

"Where a rubber covered conductor carries the current of only one a.c. motor of the type requiring large starting current it may be protected by a fuse or an automatic circuit breaker without time limit device, rated in accordance with Table B of Rule 18 (which is the rating for other insulation than rubber.) Therefore, instead of taking the value obtained for the starting current for the largest motor take the Table B rating for this value and add to the full load current of the smallest motor. Then by referring to Rule 18 Table A obtain the size of rubber covered wire corresponding to this value of total current shown in the table.

Example 1. One 5 h.p., full load starting current, 13.3 amp.
One 10 h.p., full load starting current, 25.5 amp.

According to Rule 8 (c) the starting current of a 10 h.p. motor equals 25.5 times 250 per cent equals 63.75 amps.

Then by Rule 8 (c) paragraph 5, by referring to rule Table 18 (b) we get No. 6 B. & S. gage rubber covered wire with a capacity of 50 amps., when rated according to table under rule 18 (a), therefore, 13.3 plus 50 equals 63.3 amps., or No. 4 B. & S. gage rubber covered wire for feeders (mains) to serve the 5 and 10 h.p. motors and the same can be fused as high as 70 amps., by table under Rule 18 (a).

Method 2. Proceed as in Method 1, only add the starting current of the largest motor directly to the full load current of the smallest motor and proceed to find the sizes as by Method 1.

Example 1. Same conditions and example. Starting current by application of Rule 8 (c) equals 63.75 amps. Then by table under Rule 18 (a) size should be No. 4 or 70 amps., capacity to be added instead of 50 amps., as by Method 1, then we have 13.3 plus 70 equals 83.3 amps., or No. 3 B. & S. gage rubber covered wire for service wire to feed the 5 and 10 h.p. motors and same can be fused as high as 80 amps. by table under Rule 18 (a). These methods are based upon the fact that the National Electrical Code does not state that feeders or mains can be overfused according to Table 18 (b) when used with a group of induction motors.

Method 3. Take the total full load current of both motors plus 50 per cent and furnish proper size wire according to Rule 18 (a).

Example 1. Same conditions and example. The total full load current is equal to 38.8 amps., plus 50 per cent for overload on all motors equal 58.2 amps. Then by table under Rule 18 (a) we have No. 4 B. & S. gage rubber covered wire and same can be fused as high as 70 amps.

Method 4. Take the full load current of smallest motor plus 150 per cent of the full load current of the largest motor and furnish proper size of wire according to Rule 18 (a).

Example 1. Same conditions and example. 13.3 amps. plus 150 per cent of 25.5 equals 51.55 amps. This amount being added to take care of the starting of the largest motor and we now get No. 6 B. & S. gage rubber covered wire by referring to table under Rule 18 (a) and can be fused as high as 50 amps.

Method 5. Same conditions and problems. (City of Chicago's practice). When only one motor is connected to mains the following sizes are required:

Example 1—1-5 h.p. No. 12 B. & S. gage rubber covered wire.
1-10 h.p. No. 6 B. & S. gage rubber covered wire.

When the two motors are connected on the same mains No. 6 rubber covered B. & S. gage wire may be used and can be fused to 50 amps. This is arrived at in the following manner: Motor efficiency assumed at 90 per cent, power factor 85 per cent, and the overload is considered at 50 per cent (established by special rule in the Chicago City Ordinance), therefore

$$746$$

$$= 2.56 \text{ amps. per h.p.}$$

$$220 \times 1.73 \times .90 \times .85$$

Applying these tables, in the case of mains, no overload capacity is considered unless one motor forms a large proportion of the total load in which case main must be at

*No voltage drop taken into consideration

least as large as that given under the table for a large motor alone. Unless the overload capacity on the largest motor demands the use of a wire larger than that shown under the head of "Mains" no attention is paid to the overload on these mains. The table is made up as follows: (Only six motors being shown in this table):

Size of Wires for 3-phase Motors—220 Volts, 60 Cycle			
h.p.	Full Load Current	Size of Wire 1 Motor	Size of Wire Mains
5	13	12	14
10	26	6	8
15	38	4	6
50	128	0000	0
75	192	350,000	0000
175	448	1,100,000	600,000

Instead of, the small motors, suppose we substitute

Example 2.—2-50 h.p. motors.

1.75 h.p. motors.

which are installed in the same group under the same conditions, then we have:

Example 2. Method 1. Full load current of 2-50 h.p. motors = 246 amps.; of the 1-75 h.p. motors = 186 amps., then according to Rule 8 (c) the starting current of 1-75 h.p. motor = 186 times 150 per cent equals 279 amps., then by the fifth paragraph of Rule 8 (c), under rule 18 (b) we have 000 B. & S. gage rubber covered wire or 175 amps. Therefore, 246 amps., plus 175 equals 421 amps., equals 550,000 cir. mil. B. & S. gage rubber covered cable for mains to feed the 2-50 h.p. and 1-75 h.p. motors. These mains can be fused as high as 425 amps., by rule under table 18 (a).

Example 2. Method 2. 246 amps., plus 175 equals 525 amps., or 750,000 cir. mils to feed these motors and the same can be fused as high as 525 amps., by table under rule 18 (a).

Example 2. Method 3. 246 amps., plus 186 amps., equals 432 amps., times 150 per cent, equals 648 amps., or 1,000,000 cir. mils rubber covered cable will be necessary for these mains which can be fused at 650 amps.

Example 2. Method 4. 246 amps., plus 150 per cent of 186 equals 523 amps., for which 750,000 cir. mils. must be furnished which may be fused to 525 amps.

Example 2. Method 5. Referring to table above, we have mains equals 600,000 cir. mil. B. & S. gage rubber covered cable.

When tabulating the results of the above examples we have for the first example under the various methods:

Example 1.

Method 1—No. 4 B. & S. gage R. C. wire for mains, 70 A. fuses.

Method 2—No. 3 B. & S. gage R. C. wire for mains, 80 A. fuses.

Method 3—No. 4 B. & S. gage R. C., wire for mains, 70 A. fuses.

Method 4—No. 6 B. & S. gage R. C. wire for mains, 50 A. fuses.

Method 5—No. 6 B. & S. gage R. C. wire for mains, 50 A. fuses.

For the second example under the various methods:

Example 2.

Method 1— 550,000 cir. mil. R. C. wire for mains, 425 A. fuses.

Method 2— 750,000 cir. mil. R.C. wire for mains, 525 A. fuses.

Method 3—1,000,000 cir. mil. R. C. wire for mains, 650 A. fuses.

Method 4— 750,000 cir. mil. R. C. wire for mains, 525 A. fuses.

Method 5— 600,000 cir. mil. R. C. wire for mains, 450 A. fuses.

It is very apparent that the method of finding the sizes of mains do not produce uniform results and consequently, let us analyze each method.

Method 1. Examples 1 and 2.

The results are consistent when applied to the first problem but when considering the second by this method we have the mains at 550,000 cir. mil. cable, but the total full load current of the three motors equals 432 amps., which is larger than the rated capacity of 550,000 cir. mil. cables. Consequently, on small motors Method 1 gives satisfactory results but on larger motors, the results may be too small.

Method 2. Examples 1 and 2.

Is a consistent method for both small and large motors

and allows practically 25 per cent overload to be carried on all motors.

Method 3. Examples 1 and 2.

For a group of small motors does not provide for, the starting current for the largest motor. For the group of larger motors it will not provide a capacity for the 25 per cent overload condition which is sometimes necessary on each of the motors.

Method 5. Examples 1 and 2.

Same as method 4 for small motors. On larger motors not provided for overload.

Considering direct current motors only:

Method 1. Under Rule 8 B fifth paragraph, the following: "Conductors carrying the current of only one motor must be designed to carry a current at least 25 per cent greater than that for which the motor is rated. Where the conductor under this rule would be over fused in order to provide for the starting current, as is the case of many alternating current motors, the conductors must be of such size as to be properly protected by the fuses." Take the full load current of the smallest motor plus 125 per cent of the full load current of the largest motor and furnish the proper size of wire by Rule 18 (a).

Apply to first example, with the changes that motors are 230 volt direct current.

Example 1. 1 5 h.p. full load current—19 amps.

1-10 h.p. full load current—37.6 amps.

Then 19 plus 37.6 times 125 per cent equals 66 amps., mains equal No. 4 B. & S. gage rubber covered wire by Rule 8 (B) and 18 (a).

Method 2. Take the total full load current of both motors and add 25 per cent to this value and furnish the proper size of wire according to Rule 18 (a).

Example 1. 19 plus 37.6 equals 56.6 amps., times 125 per cent equals 70.75 amps. Therefore, mains equal No. 4 B. & S. gage rubber covered copper wire by Rule 18 (a).

Method 3. City of Chicago Method.

Assumed efficiency 90 per cent, full load current of motor is calculated on the basis given by the following:

$$746$$

$$\frac{746}{220 \times .90} = 3.75 \text{ amps., per h.p.}$$

$$220 \times .90$$

the 25 per cent is added for overload for Rule 8 (b).

The following table being constructed on this basis.

Size of Wires for d.c. Motors, 220 Volts

h.p.	Full Load Current	Size of Wire 1 Motor	Size of Wire Mains
5	19	10	12
10	38	6	6
15	56	4	5
50	188	250,000	0000
75	281	500,000	300,000
175	656	1,300,000	900,000

The column headed "Sizes of Wire Mains" gives size of wire to be used for mains but in no case must the size of these mains be less than that required for 25 per cent overload, on the largest motor such mains supply.

Now applying this to example under Method 1, size of mains equals No. 5 B. & S. gage rubber covered wire.

Method 1. Instead of small motors suppose we substitute

Example 2. 2-50 h.p. approx. full load current 376 amps.

1-75 h.p. approx. full load current 281 amps.

Proper size of mains then equals 1,200,000 cir. mil. cables.

Method 2. Example 2. 376 amps., plus 281 amps., equals 657 amps., times 125 per cent, equals 821.25 amps. Mains must be equal to 1,400,000 cir. mil. cables, by Rule 18 (a).

Method 3. Example 2. We have size of mains equals 900,000 cir. mil. cables.

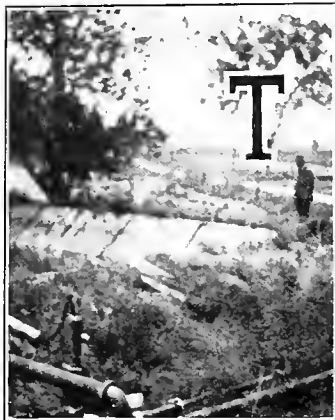
Then tabulating the results of the above examples, we have for the first example under the various methods.

(Concluded on Page 172)

RESERVOIR CAPACITY FOR SMALL PUMPING PLANTS

BY S. T. HARDING

(The proper capacity of reservoirs for various rates of discharge and the discharge of reservoir outlets for various sizes and losses of head are problems in economic design in electric pumping plants that, when properly solved, aid much in still further extending the economic use of electric energy in this lucrative field of central station load. Here are excellent data on this subject, compiled by the author who is an irrigation investigator at the University of California, which should prove helpful to central station activities throughout the irrigable districts of the West.—The Editor.)



A Corner of a Small Reservoir

THE advantages which may be secured through the use of reservoirs in connection with pumping plants have been appreciated by those connected with such irrigation practice. The actual use of such reservoirs to any general extent in any locality has usually not taken place until electric power for such pumping has been made available. The advantages to the power company which result from the higher load factor and smaller peak loads are obvious. The advantages to the consumer are also obvious where the operation season is long, particularly where the lift is sufficiently great to make the total cost of pumping relatively high. The advantages to the consumer using irrigation only as a supplementary supply with short operation seasons or for low lifts are not as great. The competition with gasoline engine plants for such conditions has caused some power companies to offer irrigation rates designed to meet such competition rather than to produce a character of use which results in the most desirable load characteristics. Where the irrigation use represents only a relatively small part of the connected load, such rates may be feasible although not returning a direct profit; where the business of a power company is largely pumping for irrigation it is necessary that the rates be made so as to control the character of use of power. Rates on this latter basis are also equally desirable for all cases where competition with other forms of power will permit.

Advantages of Large Irrigation Heads.—It is generally recognized that to secure the best results in the irrigation of any crop, at least a certain minimum size of irrigating head or stream is required. This is necessary both for efficiency in the use of the water and in the labor of its application. It is particularly true for methods of irrigation in which the land is flooded. The stream used should be large enough to occupy the time of one irrigator if labor costs are to be kept at a minimum. In flooding land, the use of small irrigating heads results in the absorption of excess amounts of water at the upper end of the runs due to the longer time required to cover the checks or runs used. By using larger heads, the water can be crowded over the land with both a more uniform distribution and a less total quantity used. With furrow irrigation the difference in the efficiency in the use of smaller heads is not as marked as the

number of furrows used at a time can be adjusted to the stream available. The labor efficiency will be reduced, however, unless the head used will supply as many furrows as can be attended to by one man.

The effect of the size of the irrigation head on the depth of water used per irrigation is illustrated by results given in the recently issued Bulletin No. 3 of the California Department of Engineering. On the silt loam soil of the University Farm at Davis measurements were made of the amount of water required to cover a one-acre check having a slope of $3\frac{1}{2}$ inches per 100 ft. when applied at different rates. The data obtained were as follows:

Rate of Application and Depth of Water		
Rate of Application Cubic Feet per Second per Acre		Depth of Water Required, feet
4.6		2.75
10.1		1.86
13.5		1.16
15.3		.84
17.8		.69

The greater efficiency obtained with the larger heads is very noticeable. These results are reduced to the equivalent size of head for a check containing one acre. With pumping plants even with reservoirs the heads secured do not often exceed 6 second feet. The area of checks should be proportionately reduced. For such conditions of soil and slopes, checks of about $\frac{1}{4}$ acre should be used for heads of 5 second feet. For smaller heads smaller checks are required for efficient use of the water.

The effect of the soil on the size of irrigation head is also brought out in the same bulletin. The results of a large number of observations in the Sacramento Valley indicated that the average size of irrigation head in second feet per acre used in checks is 23 for gravelly loams, 10.9 for sandy loams, 8.8 for silt

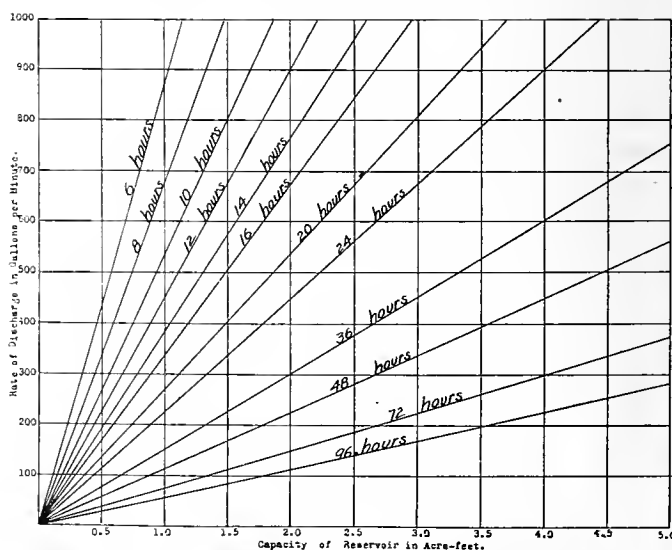


Fig. 1. Capacity of Reservoirs Required to Hold Various Rates of Discharge for Different Periods

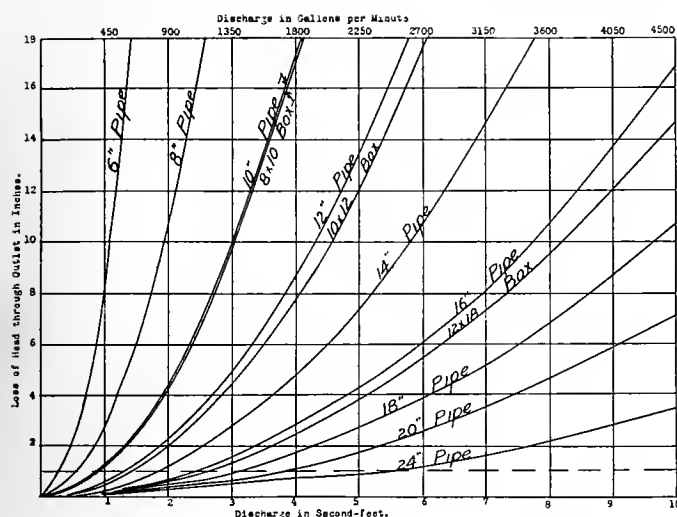


Fig. 2. Discharge of Reservoir Outlets for Various Sizes and Losses of Head

loams, 7.3 for clay loams and 3.2 for clays. The checks used on the coarser soils are usually about $\frac{1}{4}$ of an acre. The relation of size of head and area of check is particularly important on porous soils having high rates of absorption. With heavy soils the problem more frequently consists of getting sufficient moisture into the soil rather than in preventing deep percolation.

The desirable head for any condition of irrigation under individual pumping plants can be secured by either installing a plant having sufficient capacity to deliver the required flow directly or by smaller plants used in connection with reservoirs. With such reservoirs wells of small yield can be used for efficient flooding of porous soils, relatively large irrigation heads for short periods of use being secured.

Required Capacity of Reservoirs.—In selecting the capacity of a reservoir several factors require consideration. The smallest reservoir used with pumping plants should hold the discharge from 14 hours pumping. Such a reservoir will hold the quantity pumped during the night. In some cases the reservoir may hold the quantity pumped from Saturday night to Monday morning. With wells of very small yield, a sufficient capacity to hold several days pumping may be used. Smaller capacities than one-fourth acre foot are not usual. Such a reservoir will hold enough water to irrigate one-half acre 6 inches deep. Fig. 1 shows the capacities required to hold different rates of discharge for different periods of time. It is usual to provide a reservoir capacity to hold 24 hours pumping.

After the capacity has been selected it is necessary to choose the area and depths. Fig. 1 gives capacities in terms of acre feet. An acre foot is equal to 43560 cubic feet, or 325,851 gallons. For any capacity there is a relation between the area and depth which will give the minimum amount of material in the banks where the reservoir is built from material excavated from the inside. Such a relation is very involved, however, and if the value of the land used is neglected gives reservoirs of large area and shallow depth. These are objectionable due to the greater seepage area. The smaller pressures on the outlet gates make the use of larger outlets necessary. For these reasons it is usual to select the depth of water desired and

then compute the area required to give the capacity needed. For small reservoirs a depth of water of 4 ft. is usual; 5 or even 6 ft. may be used where the size exceeds 150 ft.

Reservoirs must be located so as to be above the land to be served. It is economical to use material excavated from the inside of the reservoir to make the banks. Unless located on higher land this may make the elevation of the inside too low to enable water to reach the fields. Unless such higher land is available it will be necessary to build the reservoir entirely above the ground surface, securing the material required from adjacent areas. Such construction is more expensive than that for reservoirs partly in cut.

Outlets for Reservoirs.—Outlets for small reservoirs usually consist of a pipe or box through the bank controlled by a gate on the inside. For sloping banks this requires some form of bridge from which to operate the gate. This is preferable however, to placing the gate on the outside as the outlet has to withstand reservoir pressure in this case.

The size of outlet is determined by the discharge from the reservoir when nearly empty. If the bottom of the reservoir is only slightly above the land served a large outlet will be required in order to maintain the rate of discharge when the water in the reservoir is low. A difference of elevation between the water surface in the reservoir and in the outlet ditch of 6 in. is usual. Unless this loss of head is available through the outlet the size will have to be increased in order to secure sufficient discharge. Such outlets operate as submerged orifices with short tubes, the discharge depending on the area of the opening, the square root of the loss of head or the difference in elevation of the water surface on the inside and outside and some coefficient whose value depends on the form of the opening. This coefficient may be as low as 0.70 for steel slide gates or as high as 0.80 for wooden outlets. It varies with similar types of gates depending on the velocity of approach, shape of opening and other factors. Fig. 2 shows the discharge to be expected under different conditions sufficiently closely to serve as a basis for the selection of the size to be used.

The top of the outlet pipe should be placed at the elevation of the bottom of the reservoir, so that a good rate of discharge can be secured when the reservoir is nearly empty. The bottom near the outlet can be graded so that flow to the outlet will take place. The length of the outlet depends on the height and slope of the embankment. For usual banks the length of outlet is equal to the top width plus about 4 times the height of the bank. The cost of outlets depends on the size and length of pipe. Including a bridge and the necessary excavation and backfill the average cost for concrete pipe outlets with good grade of iron gates may be taken as \$8 for 6 in. pipes in small reservoirs, \$10 for 8 in., \$15 for 10 in., \$20 for 12 in., \$25 for 14 in. and \$30 for 16 in.

Wooden box outlets are sometimes used. These are somewhat cheaper than pipe outlets of equal capacity but are less permanent and it is more difficult to prevent leakage at the gate. The smaller sizes used

are those formed by 4 pieces of the commercial sizes of lumber giving boxes such as 8x10 or 10x12. For larger sizes 12x18 is usual. For small sizes 1 in. material is generally used, for the larger sizes 2 in. thickness is required. The discharge is similar to that of pipes of equivalent area. The gates are wooden slides, the guides extending to the bridge from which it is operated, the costs in place are about \$9 for 8x10, \$12 for 10x12 and \$20 for 12x18 for the usual lengths of box required.

The discharge from the pump is more generally conveyed over the top of a reservoir than into the bottom. When the inflow is at the bottom the average height to which the water is pumped is less with some saving in power which may affect the consumers cost where meter rates are used. For high lifts the saving for the usual depths of reservoirs is relatively small. An inlet in the bottom of the reservoir requires a valve in the discharge line of the pump to prevent the water flowing back through the pump when it is not operating. A check valve is frequently used to relieve the pump casing of the static pressure when the pump stops but such a valve may not close tightly, causing leakage. To avoid any chance of backflow the majority of plant owners carry their inlet pipes into the reservoir just above high water level.

A RIVAL TO X-RAYS

According to the Electrical Review of London the Patents Court has recently disclosed that the Röntgen-rays are no longer the only agency which will enable organic bodies to be examined internally. A remarkable process was discussed when the Trustees of the South Kensington Museum (Natural History Section) applied for license to use a German patent which imparts to animals a transparency so thorough that every bone, muscle, and artery can be seen distinct through the skin.

Dr. S. F. Harmer, F. R. S., who made the application, said the transparency was not something vague, like a radiograph, with blurred outlines; it was a transparency vivid and direct as that of glass itself. The supreme advantage of the method was that every specimen treated became a permanent object lesson for study purposes or museum exhibition. He had a rat whose every organ could be seen. The process employed the principle of the refraction of light, and it relied upon chemical solutions, made according to formulae, to have each a required index of refraction.

The Controller of Patents (Mr. Temple Franks) said he thought nothing should be allowed to stand in the way of the authorities at the British Museum making full use of this process, though he did not see how anyone could very well claim a patent right in the principle of the refraction of light.

CHEMISTRY OF MAN

According to a writer in *Monad*, as digested by the Electrical Age, a man weighing 150 pounds approximately contains 3500 cubic feet of gas, oxygen, hydrogen and nitrogen in his constitution, which at 80 cents per thousand cubic feet would be worth \$2.80

for illuminating purposes. He also contains all the necessary fats to make a 15-pound candle and thus, with his 3500 cubic feet of gases, he possesses great illuminating possibilities. His system contains 22 pounds and 10 ounces of carbon or enough to make 780 dozen or 9360 lead pencils. There are about 50 grains of iron in his blood and the rest of the body would supply enough to make one spike large enough to hold his weight. A healthy man contains 54 ounces of phosphorus. This deadly poison would make 800,000 matches or enough poison to kill 500 persons. This with 2 pounds of lime makes the stiff bones and brains. No difference how sour a man looks he contains about 60 lumps of sugar of the ordinary cubical dimensions, and to make the seasoning complete must be added 20 spoonfuls of salt. If a man were distilled into water he would make about 38 quarts or more than half his entire weight. He also contains a great deal of starch, chloride of potash, magnesium, sulphur, and hydrochloric acid in his system.

Break the shells of 1000 eggs into a huge pan or basin and you have the contents to make a man from his toenails to the most delicate tissues of his brain. And this is the scientific answer to the question, "What is man?"

(Continued from Page 169)

Example 1.

Method 1—No. 4 B. & S. gage R. C. wire for mains, 70 A. fuses.
Method 2—No. 4 B. & S. gage R. C. wire for mains, 70 A. fuses.
Method 3—No. 5 B. & S. gage R. C. wire for mains, 55 A. fuses.

A second example under the various methods:

Example 2.

Method 1—1,200,000 cir. mil. R. C. wire for mains, 730 A. fuses.
Method 2—1,400,000 cir. mil. R. C. wire for mains, 810 A. fuses.
Method 3—900,000 cir. mil. R. C. wire for mains 600 A. fuses.

It is again apparent that the methods of finding the size of mains for direct current motors do not produce uniform results and when analyzing these results we are forced to conclude as follows: analyzing—

Method 1. Examples 1 and 2.

Consistent results are obtained from both small and large motors and these results are generally acceptable on small groups.

Method 2. Examples 1 and 2.

Quite frequently mains computed under this method cause too extravagant use of copper and are necessarily large.

Method 3. Examples 1 and 2.

Quite frequently mains are too small and have to be increased in size.

As yet we have only considered small groups of motors less than five in number and it is apparent that confusion exists due to the various methods used commonly in computing the size of the mains.

When there is a greater number of motors in a group than considered here, the "Demand Factor" enters into consideration also and becomes generally a predominating factor in determining the proper sizes of mains.

Consequently, the Electrical Board of Appeals, Portland, Oregon, realizing the confusion, have devised a method of attack which is original and unique.

This treatment of Demand Factor will be set forth in a later article which will appear in the columns of the Journal of Electricity.

PHASES OF THE ELECTRICAL CONTRACTORS' BUSINESS

BY H. C. REID

(Even the electrical contractor who deals largely in material fixtures, finds himself face to face with questions of public policy. Here is a masterly article that treats of interesting and important phases of the contractor's business in his relation to the public, in addition to covering items that affect his system of cost accounts. The author is the newly-elected president of the California Association of Electrical Contractors & Dealers. This paper was read at the recent Santa Cruz Convention of the Association and should prove helpful to other contractors throughout the West.—The Editor.)

In considering the electrical contractors' and dealers' business as a whole, we find many conditions that are productive of discussion. Constructive criticism is one of the best means at our command to show up the defective elements of our business.

The electrical contracting business has been lacking in those financial returns that would be deemed proper and adequate for an industry of this volume and character. The part that the contractor has in contributing to the health and comfort of mankind, the energy and ingenuity he expends in the performance of his work, the capital he invests, which is subject to greater risks than the majority of commercial or manufacturing enterprises, most certainly justify the expectations of a fair and reasonable profit as his returns.

In reviewing the situation we find as the first and foremost of the causes tending to create an unhealthy business condition, the lack of an adequate knowledge of costs. We find that undue and unjustifiable credit privileges on the part of jobbers and other sales mediums contributes its part. We find also many poor and incomplete plans and specifications that cause a financial loss to the contractor. We find an absence of state or municipal licensing or examining commissions which should pass upon the qualifications of those conducting business. We unfortunately find that the majority of electrical contractors and dealers lack the proper commercial training in business management and financing.

Each one of the features above quoted is responsible for a certain portion of the defects of the business, but of all those quoted, unquestionably the first one,—that is, the lack of knowledge of costs,—is the most vital. This requirement is so broad in its full scope and so far reaching in all phases of the business that we might be able to disregard, temporarily at least, the others mentioned, if we were all thoroughly well schooled in the subject of costs.

Costs are the beginning of all our transactions, and on the properly determined cost depends the profit or loss as the final result. It is of vital importance to the contractor that he be thoroughly familiar with the different elements entering into the cost of doing business. Not until he is familiar with these costs will he be able to so conduct his business that an actual net profit will be the result,—but cut-throat competition, as a result of insufficient knowledge of costs, has been so long an established practice, that we have as a further obstacle prevalent acceptance of costs that are not complete costs, and percentages

added for profit, that are entirely inadequate.

As much of our work is done under the supervision of architects and consulting engineers, our interests demand that they should be made familiar with the facts about our business requirements. While they generally accept the fact as correct that a contractor has some overhead expense, I do not believe they understand or appreciate the reasons for different

percentages existing in the different trades, and doubtless also it is difficult for them to accept without question the statement and assurances in regard

ent percentages existing in the different trades, and doubtless also it is difficult for them to accept without question the statements and assurances in regard to costs of some contractors who are endeavoring to obtain an actual net profit for their work, in comparison with the actions or figures of other contractors who to all appearances are as well qualified to know their business needs.

We are advised by the Federal Trade Commission that only 10 per cent of the American manufacturers and merchants actually know their costs of doing business. It is the aim and endeavor of this association to so gather and distribute the facts, that the electrical contractors and dealers of the Pacific Coast will be added to the 10 per cent. As a result of several hundred thousand businesses investigated by the commission, they give us these pertinent facts:

200,000 corporations out of 260,000 are merely eeking out an existence; 100,000 of these corporations are not earning any net profits.

30,000 out of 60,000 doing a business of \$100,000 a year each, have such a vague idea of management that they charge off no depreciation.

The figures quoted are authentic; they show that 90 per cent of all the business concerns are drifting blindly along without profit to themselves, a menace and a danger to established and legitimate business.

Let us learn from the Federal Trades Commission these lessons in the first principles for the conduct of business.

Let us hope that as a result of this convention an interest has been stimulated to an intelligent study of business problems, its defects, its needs and its remedies. Let us endeavor to secure in the efforts for betterment, the co-operation of not only those different branches of the electrical industry, but of other business interests. Let us hope that all, the contractor, the architect and engineer, the public, will better appreciate the fact that ignorant and cut-throat

A MOTTO FOR THE ELECTRICAL CONTRACTOR

"Whatever promotes the welfare of that broad group of people which we call the public, is bound to react favorably on individual concerns."

competition is dangerous to the community as well as the individual.

The methods followed to obtain all of the costs upon which to make a bid, or to determine the selling price of your material or labor, differ widely. An estimate form upon which can be listed accurately and clearly the many articles and the many different segregations of labor entering into a job, is, first of all, a necessity. Many different forms are in use, being the individual's ideal of what an estimate should show and record. Our California State Association has furnished its members with an estimate form which is the result of the study of the forms previously used by several companies, and from that study, a standard estimate form has been prepared, combining the several good features found.

The ideal estimate should present complete information to any one, not only the estimator, of all features of the job. The estimate should be divided into the same natural divisions as the job. To state that more fully: Each floor of the building should have its material separately listed. Each different part of the electrical systems, such as lighting, power, telephone, both public and private, bell systems, clock systems, calling systems, fire alarm systems, etc.,—all should be so recorded that the cost of any one system can be readily separated from the total, as is frequently needed on account of alterations or omissions. An estimate is just an opinion of the estimator as to the amount of material and labor entering into the work in question, and the correctness of these items can only be proven by a proper and accurate system of cost accounting.

Some contractors have no accounting system at all—some know their costs only when the job has been completed, and in most cases the changes and alterations in the original job so confuse their records that a direct comparison of the cost records and the estimated costs does not give a satisfactory answer as to accuracy of the estimate.

We should have for the proper conduct of our business, first, a detailed estimate; second, detailed weekly reports that can be checked against the estimate. This system of reports must not be burdensome with too much detail, as it must be, by necessity, prepared and submitted by the workmen on the job, and must, for the sake of economy and time at the office, be simple and concise. This cost data should be tabulated and submitted to the estimator with regularity.

Manufacturers devote a great deal of attention to the compiling of cost data, and as a result, they are generally enabled to fix their selling prices so as to maintain a sound financial condition.

Incidentally, it would seem reasonable to believe that our State University should be able to assist us in the preparation of the cost accounting system needed by our particular industry.

The cost of an electrical installation is divided into three general divisions: material; labor, overhead expense. By means of the estimate previously described, we determine the cost of the material and the labor, and by means of the accounting system maintained, we determine the cost of doing business.

into that last item is charged those expenses that are not a direct result of any particular job. The item of overhead expense absorbs a multitude of expenditures. Not only does it include the salaries of the executives, superintendents, estimators, clerks, shop expense, office expense, taxes, fire insurance, advertising, dues of commercial clubs, associations, etc., but it must also include the elusive items of depreciation of tools, merchandisc, office fixtures, automobiles, the obsolescence of materials as well as interest paid on borrowed capital. It must absorb the loss on bad accounts, losses on jobs—which are inevitably bound to occur,—and in fact, all that long list of items that are included in the conduct of a business.

I wish to note here that some concerns take into overhead, the items of cartage to jobs, compensation and liability insurance. Cartage should be charged direct to the job, and insurance costs should be pro rated to the different jobs, using the amount of labor paid as the basis for pro rating. As the total annual overhead expense must be distributed over the business done, this cost must be added to the estimated cost of the labor, material and incidental items above mentioned, as a percentage in an amount that the annual overhead bears to the sum total of costs of all jobs done in the same period.

As an illustration of the foregoing, let us assume that your average overhead expense for the year is \$10,000, and also assume that the labor and material cost of jobs is \$40,000. Therefore, the overhead expense for that period is 25 per cent of the job costs, and so the sum of 25 per cent must be added to your labor and materials estimate, to determine your actual total cost.

If, to your cost now determined, you add the sum of 20 per cent for profit, we now can compute your net profit for the transaction as 16 $\frac{2}{3}$ per cent on the sales price.

As a further illustration of this summary:

The cost of labor and material is, say.....\$1000.00
Overhead expense, say, 25 per cent..... 250.00

Total cost\$1250.00
Profit, say 20 per cent..... 250.00

Selling price\$1500.00

The \$250 added for gross profit, therefore, equals 16 $\frac{2}{3}$ per cent net.

The percentages to be used must logically be determined by each individual as the requirements of his business dictates, and as may be expected, a wide range of costs exists. During the past fiscal year of the Association, an effort has been made to secure from its members, statements giving their costs of doing business for the year, and their gross volume of business done.

As there is no standardized system used, however, to compute overhead expense, an analysis of accounts would disclose the fact that what some concerns consider overhead, another has overlooked or not considered.

Profits: Around this subject of profits revolve all our business activities. Success or failure hang on this work. The profits that accrue to you will not be

due, however, entirely to your individual efforts. The success and prosperity of your competitor is as necessary before you can count your profits as is your success necessary for him.

I believe I am violating no confidence in telling you that the electrical contracting business has been short on profits, which is due largely to the fact that the prices charged for our services have not been sufficient to yield a net profit. The discussion of this subject of profits leads us back immediately and directly to the subject of costs again. The percentage provided, for in estimates to yield profits has been absorbed to take care of the costs not estimated. How often does a contractor consider the length of time that his money will be tied up in a job, in determining the cost of that job? Invariably a discussion with the architect or engineer on the subject of profit brings out the fact that they expect you to perform work at a percentage fixed that has no consideration at all for the length of time of the investment. Many jobs are in course of construction for two years or even more; some jobs can be completed in two months. If a contractor could confine himself to the jobs being completed in two months, he would be able to turn his money over six times a year. If he confines himself to jobs running two years, the item of cost for capital invested would be twelve times the amount used for the same item in the first case mentioned.

A further illustration of this principle might be given you with this case as an example:

Assume that a contract that you have amounts to \$20,000, with 25 per cent withheld until 35 days after acceptance, and that about time of completion, an alteration amounting in cost of labor and material to \$500, is desired. Interest on \$5000 (25 per cent of contract) held for one month due to additional work, at, say, 6 per cent per annum, equals \$30. This cost is entirely due to the performance of the \$500 job added, and it would seem that this latter job should bear the expense of this interest on the deferred payment as a part of its cost. Such, however, is not the custom, to the best of my knowledge.

It is to be seen that conditions of the kind cited are either forced on or accepted by the contractors as a result of their lack of knowledge of business and financial requirements.

Just what percentage of profit should be considered fair and reasonable is a matter for discussion.

In considering this we must bear in mind the several different characteristics of the business:

It requires technical knowledge and practical experience on the part of its manager.

It involves considerable financial risk due to conditions beyond the control of the contractor. Labor costs frequently vary as much as 50 per cent on account of construction methods followed by the general contractor.

On account of the irregularity in closing contracts for new construction work, the organization is not always working at its best efficiency.

Ten per cent seems to be generally accepted as a standard,—as being the proper amount for a contractor's profit, as evidenced by government contracts for ship-building, etc., building contracts for general construction and by the acceptance occasionally by electrical contractors of their portion of the work.

My contention is, that while 10 per cent may be entirely satisfactory on a ten or twenty million dollar job such as the Union Iron Works secured, 10 per cent shrinks perceptibly in its comparative sufficiency on a \$100,000 job, and going one more step, 10 per cent on a \$1000 electrical job almost entirely disappears from view. It should be noted here that the 10 per cent allowed on the immense government jobs is net, not gross, and that all the elements entering into the cost of doing business will be properly computed and included in the cost.

The electrical contractor knows too little about banking requirements and banking methods. In the past he has expected and has generally obtained the credit necessary from the jobber with whom he does his business, which has in turn contributed its measure as a demoralizing influence. It is obvious that when a creditor is placed in the position of carrying his customer for more than the customary credit period, he becomes indirectly a competitor of his other customers, which is unfair, both to his other customer and to himself.

It is thought by many that by the general use of the trade acceptances between the jobber and the contractor, better conditions will exist, first, for the seller on account of having a fixed date of settlement specified in the transaction, and second, for the contractor for the reason that it will be the means of compelling him sooner or later, to conduct his financial business with a bank and not a jobber. It will keep the buyer closer to his financial obligations, which in turn, require better collection methods and closer scrutiny to the credit he in turn extends, all of which tends toward better business.

One of the great and crying needs among business men today, to quote Edward N. Hurley, is a broad view of business in general, and a comprehensive grasp of the needs of industry as a whole. Too many American business men center all their energy and attention upon their particular establishment and the work of making profits for it.

Men at the head of factories need the point of view of what might be termed—the statesmanship of business. They need to appreciate the fact that their plant is a part of a great industry, that their individual welfare depends very largely upon the welfare and progress of their industry as a whole, and of industry in general.

Whatever promotes the welfare of that broad group of people which we call the public, is bound to react favorably on individual concerns.

At a recent meeting of the Physical Society of London, a demonstration of a method of preventing sparking at a rapid make and break, which incidentally produces colloidal platinum, was given by Dr. A. Griffiths. The device consists of a series of electrolytic cells placed as a shunt across the spark-gap. The electrodes consist of platinum and the electrolyte of strong sulphuric acid. The cells polarize, and on making the gap an e.m.f. is introduced opposed to the e.m.f. of the battery, so that the current rapidly diminishes, decomposing the liquid and doing chemical work.

SUGGESTIONS FOR CONTRACTOR AND DEALER

DEPARTMENT CONDUCTED BY GEORGE A SCHNEIDER

(Private telephone installations, as distinct from the trunk line systems, are growing in importance as each month passes. The army contingents, the office in the city, the home, the hotel, the apartment, the farm and its out-houses—all are finding ever increasing uses for the interior telephone system. Here is the very latest notation on pointers that should prove unusually helpful in running down and remedying the troubles that are encountered in this system of communication. The author is power apparatus specialist for a well-known electrical supply house of the West.—The Editor.)

HELPFUL NOTES ON INTERIOR TELEPHONE SYSTEMS

Apparatus for private intercommunicating telephone systems is now well standardized and there are numerous complete systems to meet the different requirements of the home and business. These systems differ only in the number of instruments that can be connected and the service performed. When using such apparatus, each party becomes his own operator and the number of instruments that can be connected to a given system is necessarily limited.

A complete system consists of the following:

- (a) Telephone instruments.
- (b) Necessary wires or cable to connect between instruments, batteries and other apparatus.
- (c) Batteries to furnish current for talking or ringing.
- (d) Miscellaneous accessory apparatus, when required, such as door openers, annunciators, letter boxes.

According to the class of service, the various systems may be grouped as follows:

- (a) Code ringing, common talking.
- (b) Selective ringing, common talking.
- (c) Selective ringing, selective talking.

When properly selected and installed any system will give good service within the limits of its design, but the best and most satisfactory one is the selective ringing, selective talking system. It should be used where a high grade of intercommunication is desired. It permits of any station calling any other, and is absolutely non-interfering. That is to say, as many conversations can be carried on simultaneously as there are pairs of stations, without any conversation interfering with another. However, when any system is carelessly installed trouble is sure to develop and the telephone system is likely to become a nuisance and source of expense rather than a convenience and labor saving proposition.

It is the purpose in this article to discuss briefly a few of the most common troubles that develop in connection with such installations and to suggest how they may be eliminated. The discussion is of a general nature and is not intended to cover any particular system or make of apparatus. It should be further noted carefully that the remarks do not in any way apply to telephone systems installed or operated by public telephone companies.

Troubles Due to Poor Wiring

Poor wiring is by far the most common cause of trouble, in fact, it is safe to say that seventy per cent of all trouble can be attributed to this cause. This is not at all surprising because telephone wiring is generally treated as would be the wiring of an ordinary bell and annunciator or similar signal system. Because the wires must carry only a minute current and

because of the very low voltage such wiring does not receive the same care either from the wiremen or other artisans on the job as would the electric light or power wiring. Again signal systems are not generally inspected as must be the light and power wiring. In many cases the joints are poorly made, wires are grouped together without any precaution and are often allowed to come in contact with grounded water, gas or heating system pipes. In one case of trouble which was called to the writer's attention some time ago, the wires were found to be buried for a short distance in concrete. Ordinary annunciator wire had been used. It soon rotted through and caused a short circuit between the various wires of the system. In another instance, wires had been drawn into a conduit containing water. This particular trouble was an expensive one to locate. It took three days for an electrician and his helper and the assistance of a representative from the manufacturer. The contractor making this installation originally claimed that the difficulty was due to defective or incorrectly wired instruments, whereas, as developed later, it was finally traced to careless wiring.

Common annunciator wire is the poorest that can be used for this service, in fact, for any signal system. The insulation of this wire is light and easily removed. Although paraffined it takes up moisture rapidly after having been in use for some time. Weatherproof annunciator wire is far superior to the common kind just mentioned, but the most satisfactory wire is the rubber insulated weatherproof braided twisted paired wire commonly known to the trade as "bridle wire." These wires are twisted to prevent inductive disturbances. When more than four wires are required cable is recommended in preference to individual wires. While cable costs somewhat more than the corresponding number of individual wires, it is much easier to install and makes a more substantial and better lasting installation.

A further advantage of cable is that the individual wires are of different colors, making the various circuits easy to identify and thus saving the time required to test out the circuits when separate wires are employed.

Several types of cable are available on the market. For use in dry places there is an interior cable with outside braiding treated with gray fire-proof paint. When used in dry places where it will be exposed to view a similar cable with green glazed cotton outside braiding is available. Any of the fire-proofed type of cable can be furnished lead covered and this class of cable is recommended for use inside in every case where there is apt to be moisture, even in a small degree.

In any case whether individual wires or cables are used, the wiring must be carefully done. In all cases the wiring should be properly supported and protected. If staples are used, no two wires should be secured under one staple except possibly when twisted pairs are used. Only staples having insulated heads should be permitted. Care should be taken to keep the telephone wires away from light wires or other circuits and also clear of all pipes. Special precaution is advisable when telephone wires are run in shafts with other wiring and where necessary wires or cables should be properly protected by conduit or by an equivalent means. Likewise care should be exercised when passing wires or cables through floors or walls. No wires should be placed in plaster or concrete on account of the rapid deterioration. All joints should be carefully soldered and taped with rubber tape and then covered by friction tape. All joints in twisted pair wire should be separated at least six inches.

In every installation it is good practice to install an extra wire or two depending upon the size of the system. An extra wire saves a great deal of expense in case one of the wires becomes broken and costs but very little to install. The size and number of wires will depend entirely upon the system and maximum distance between stations. This should always be determined before starting the job.

Troubles at Instruments

Next in order we may consider trouble at the instruments. These are not so frequent as to those due to defective wiring and are also much easier to correct. Trouble at the instruments may be due to wrong connections, either internally or externally. Occasionally instruments are wired wrong at the factory but more often wrong connections are made between the instruments and wires or cables of the system. Again a mistake may occasionally be made in shipping instruments for a different system of wiring or perhaps only one of the instruments is wrong. Trouble is also very likely to develop when an attempt is made to add instruments of one make to a system in which telephones of another make were originally installed. Selection of different makes of instruments to operate together should be made only by experienced persons and in no case should it be done without the approval of the manufacturer, of either one or the other make of instruments. This same question must be considered before doing a job of wiring because if the number of wires is suitable for a certain system it does not necessarily mean that the number will be correct for a similar system of another make or for a different system of the same manufacture.

Battery Troubles

Battery troubles are perhaps the most common in connection with these telephone systems, not because the battery is necessarily the weakest part of the system, but because the battery is the part most likely to be effected by any defects in the wiring or instruments that would cause a short circuit or continual drain from the batteries. When the correct number of cells is supplied and when properly installed in a cool, dry place, a set of batteries will last

many months in ordinary service. This is especially true when batteries designed only for telephone or similar signal service have been provided. On the contrary when the batteries run down rapidly and the transmission is quickly effected, it is almost a sure sign that there is either a wrong connection or short circuit that is causing the battery to run down, either due to a repeated heavy current discharge from time to time, or a continuous flow of current such as would be experienced in connection with a high-resistance leak between wires or the equivalent.

A case of this kind came to the writer's attention some few months ago. A certain contractor had been called in to repair a system that had been giving trouble off and on for about three years. The difficulty was that the batteries gave out so quickly and the owner of the building became suspicious that there must be other trouble after paying the first contractor to renew the batteries so many times. The second contractor went at the job in a more systematic way. He made careful tests and soon found the batteries were under a continuous but small current discharge. After checking up the connections carefully, the trouble proved to be caused by a retardization coil which was incorrectly connected into the circuit in such a manner as to form a high resistance path across the battery leads.

The Remedy

Most of these troubles—and especially those resulting from careless wiring—can be eliminated by a little forethought when laying out the system.

The architect or engineer writing the specifications should be more specific and more careful with some of the minor details which are often overlooked but yet cause most of the trouble. He should specify the kind of system required, the number of stations, the kind of wire or cable that shall be used, the number of extra wires to be provided, and shall insist upon a suitable place for the batteries. He should then have the wiring carefully inspected before the wires are covered and know that his specifications have been followed. He should further insist that a diagram showing in detail the scheme of connections be posted in some convenient and accessible place so that in case of trouble the wires can be easily traced out and identified. This diagram should show the manufacturers' number or some equivalent designation which would enable him to identify the system if called later for assistance or suggestions.

Further, the contractor should be required to guarantee and keep the system in order for at least one year. This requirement will tend to eliminate those bidders who are inclined to do poor work but will not in any way work a hardship on the reliable contractor.

The contractor receiving the job should consult with the manufacturer regarding the installation unless he or his men have wide experience in this line. An hour spent in this way will be very beneficial to all concerned. The manufacturer can point out certain features about the system, supply suitable wiring diagrams and instructions and in many cases can make suggestions that will save time and money for the contractor.

FUEL OIL AND STEAM ENGINEERING

(Recent advances in fuel oil practice require that the engineers constantly bear in mind the particular design and classification of the boiler under consideration in order to produce the best economic results in steam generation. In this discussion the authors first give the fundamental requirement for boiler installation in modern power plant design and then discuss a number of the more prominent types of commercial boilers found on the market. In closing, the leading characteristics of marine boilers as distinguishing them from stationary boilers are set forth.—The Editor.)

BOILER CLASSIFICATION IN FUEL OIL PRACTICE

BY ROBERT SIBLEY AND CHAS. H. DELANY



A Battery of Fifteen Boilers oil-fired, requiring but Two Men for Their Operation

N the generation of steam by the tea-kettle the cycle of operations through which the water and steam pass is quite simple. The heat applied at the bottom of the tea-kettle is absorbed by the water along its surface exposed to the heat application. As this heat is absorbed the water is raised in temperature and due to its immediate expansion becomes lighter than the water above it and consequently passes to the top to allow cooler water to descend, which in turn becomes heated and passes to the top to make way for still other water to become heated. This cycle of operations continues and finally evaporation takes place. The steam thus generated passes to the atmosphere without.

In the modern high pressure steam boiler the operation is somewhat more complicated. The water circulation proceeds on the same general principle but since steam generation is the important function and not merely the supplying of hot water as in the tea-kettle, some space must be provided wherein to store the steam that is generated. This is usually accomplished in the space above the water level in the main boiler shell or drum. If superheated steam is to be produced, the saturated steam is conveyed from this space into pipes known as a superheater. These pipes are exposed to the hot furnace gases and the steam passing through them readily absorbs heat, thus superheating the saturated steam to any temperature determined upon.

The Boiler Drum and Tubes.—It has been mentioned that the tea-kettle is a most inefficient boiler and so it is. While mechanical stresses and strains involved necessitate the employment of cylindrical shells for boilers, still the boiler itself resembled in the early days of the steam engine but slight variations from the tea-kettle.

It soon became apparent, however, that the actual surface exposed to the heated gases of the furnace has much to do with efficient steam generation. Hence while the first type of boiler was made in a solid shell, variations from this standard soon made their appearance. Let us now examine some of these types.

Internally and Externally Fired Boilers.—In the earlier type of boiler the fire was kindled beneath the

solid cylindrical boiler shell. Such a type became known as an externally fired boiler. Later the boiler compartment was hollowed out and the fire kindled inside this hollow space, thus introducing the internally fired type. The locomotive boiler is today an illustration of this type of boiler.

The Return Tubular Boiler.—Another type soon developed wherein the fire was kindled beneath and the flue gases returned to the front part of the boiler through a series of flutings or tubes passing through the main part of the boiler shell. Such a boiler became known as a return flue boiler or return tubular boiler depending upon whether or not the tubes or flutings exceeded six inches in diameter—the flue being the larger diameter and the tube the smaller.

The Fire Tube and the Water Tube Boiler.—A great many types of boilers finally made their appearance on the market in some of which the fire passed through the tubes which were surrounded by water in the boiler shell, and in other instances the water passed through the tubes around the external surface of which the heated gases were made to pass. The former became known as fire tube while the latter were called water tube boilers. It is generally conceded that where rapid steaming is required the latter type is far preferable.

It is now universally the custom to use water tube boilers in all large stationary power plants, the principal reasons the following:

1. Small floor space required.
2. Greater safety at high pressures due to the small diameter of the drums and tubes.
3. Greater flexibility so that expansion strains are not injurious, permitting
4. Rapid steaming and sudden change of load.

Tubular boilers still have their field in small one man plants, where owing to the large quantity of water contained in the shell they maintain a uniform pressure with but little attention.

Tubular boilers of the Scotch marine type are still extensively employed in marine work where owing to the steadiness of the load they have met with great success.

Vertical and Horizontal Types.—Still other classifications are made based upon whether the tubes and boiler shell be in a horizontal or vertical position, the former being called, as one would presume, the horizontal and the latter the vertical type of boiler. As time went on still other boilers appeared which could neither be called horizontal nor vertical but an intermediate classification became necessary.

Let us now examine two types of boiler used in the modern central station in order the more clearly to grasp the fundamentals of boiler design and principles of operation.

Illustrations of Principles of Construction and Operation.—Before proceeding to the brief description of these two types of boiler, the reader must bear in mind that these particular two are picked as best setting forth principles of construction and operation, and not necessarily as a preference for commercial installation. Many types of boiler are today upon the market and in their separate and distinctive features such possess characteristics that must be carefully considered in making a commercial choice. With this understanding let us then proceed to examine these two boiler types of commercial practice.

The Babcock and Wilcox Boiler.—By a close examination of the illustration as shown herewith the Babcock and Wilcox boiler is seen to be composed of one or more horizontal shells or drums from which are suspended a series of inclined tubes.

In this type of boiler installation the oil burner is located in the rear of the furnace and the fuel oil is shot forward toward the front; thus this type is known as the "Back-shot" type of installation. The heated gases then pass upward and around the tubes through what is known as the first pass. At the top of this pass the heated gases envelop the lower half of the boiler shell and are then diverted downward through and around the superheater tubes shown immediately below the drum until the journey through second pass is completed. At the rear of the furnace wall they are once again diverted upward through the third pass and then after contact with the boiler shell, they are conveyed out through the breeching up the stack or chimney. In this manner the heated gases are brought into intimate contact with the water tubes and efficient steam generation accomplished.

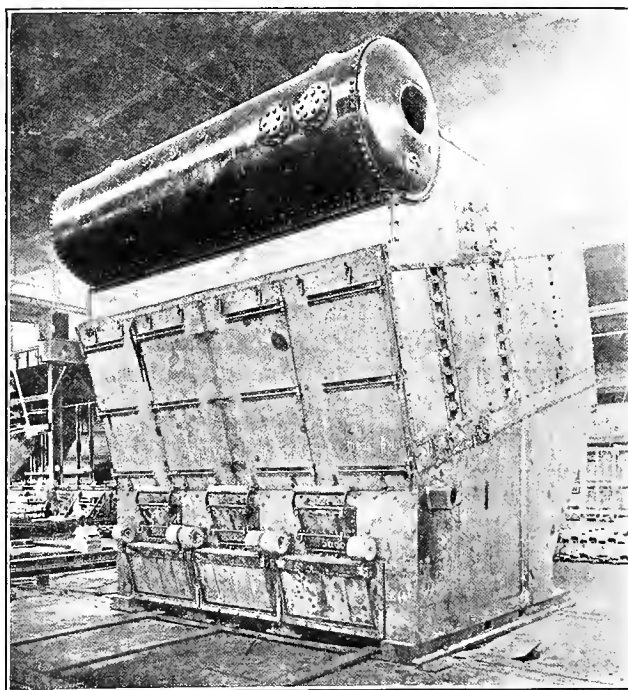
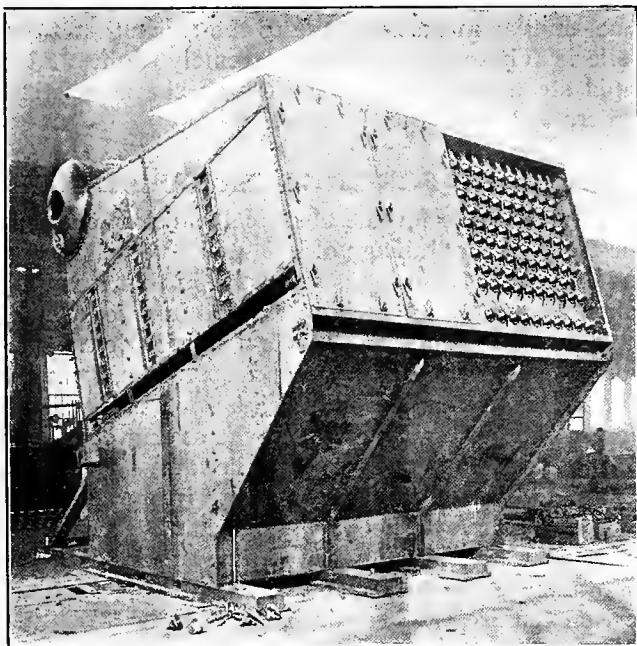
Water Circulation.—The water for steam generating purposes is introduced through the front drum-head of the boiler. It then passes to the rear of the

drum, downward through the rear circulating tubes to the sections. Then it courses upward through the tubes of the sections to the front headers and through these headers and front circulating tubes again to the drum where such water as has not been formed into steam retraces its course. The steam formed in the passage through the tubes is liberated as the water reaches the front of the drum. The steam so formed is stored in the steam space above the water line.

The Parker Boiler.—Another type of boiler which is exceedingly interesting, as its operating principles are almost diametrically opposite to the foregoing is that of the Parker boiler.

As seen from the illustration, the fuel oil is shot from the front of the furnace to the back. The heated gases in their journey toward the rear come in contact with the lower set of tubes and at the rear they pass up through the superheater. They are then deflected back horizontally toward the front, passing parallel along the water tubes. At the front they return again to the rear along the third set of tubes and also along the lower half of the boiler drum above.

Water Circulation.—Water enters the upper set of horizontal tubes from the front without passing first into the boiler drum above. At the rear it is conveyed upward into the drum which has a longitudinal diaphragm separating the steam section above from the water section beneath. This water having emptied upon the diaphragm in the upper compartment flows down along the diaphragm to the front. At this point it is dropped down into the next section of tubes to be again discharged upward into the upper rear section to flow again down along the diaphragm to the front and again to be lowered into the lowest section of hori-

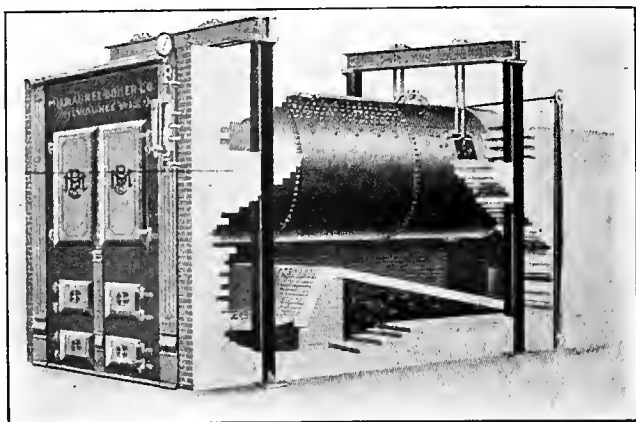


THE B. & W. MARINE TYPE OF BOILER—REAR AND FRONT VIEW

Water tube boilers for marine service are built as modifications of both the B. & W. and the Heine type, the tubes being shorter and smaller in diameter than is the case in stationary boilers. The boilers are encased in steel, lined with light insulating material inside, instead of being set in brick. They are constructed of the highest grade of forged steel. Marine boilers frequently carry pressures as high as 300 lb. per sq. in.

zontal tubes to return into the diaphragm section above as saturated steam.

It is seen by comparing those two types of steam generation that contrary and opposite theories are used. The first fires the oil flame from the back



A Milwaukee High Pressure Horizontal Tubular Boiler with Full Front and Suspension Setting

toward the front, while the latter applies the opposite process. The first admits the water into the drum and then produces a water circulation from the lower sections upward; the latter takes the water first through the top sections and winds up at the lower. The first sets forth the theory of right angle impingement of heated gases against the water tube surface while the latter takes the paralleling flow theory. The remarkable thing about the whole comparison is that both have produced wonderfully efficient steam generating achievements in carefully conducted fuel oil tests on the Pacific Coast.

The Stirling Type.—The Stirling boiler consists of three steam drums connected to one mud drum by means of bent tubes. The bending of the tubes does away with the necessity of using headers and furthermore provides for expansion of the tubes due to change in temperature. As a result this boiler is not only simple in design but very flexible and capable of withstanding a good deal of abuse. The baffles are arranged in such a manner that the gases of combustion travel up the front bank of tubes, down the middle bank and up the rear bank. This boiler may also be fired by either the front shot or the back shot oil burner. With the front shot burner the flame is forced right among the front bank of tubes which are, therefore, effective as heating surfaces. The back shot burner has the advantage of shooting the gases forward to a large combustion chamber so that more perfect combustion can be obtained, although at the expense of making the heating surface of the front bank of tubes less effective owing to the fact that the gases do not come in such intimate contact with these tubes.

Other boilers of the general Stirling type are the Badenhausen, the Rust boiler and the Erie City vertical boiler.

The Heine Type.—The Heine boiler is a horizontal water tube boiler similar to the B. & W. boiler except that instead of having separate headers the tubes are all expanded into a single water leg at the rear and another at the front. These water legs have large

flat surfaces which have to be strengthened by stay bolts. Owing to the fact that all of the tubes are connected to the same water legs, this boiler is not as flexible as the other two types described above. The Heine boiler is usually provided with horizontal baffles so that the gases of combustion pass first to the rear of the boiler and then forward among the tubes and then back again. With this arrangement of baffling the front shot oil burner introduced through the front wall is very successful. Other boilers of the Heine type are the Keeler and Edgemoor boilers.

Marine Boilers.—For mercantile marine service the standard boiler for many years has been the Scotch marine boiler which is a fire tube boiler consisting of a large shell within which are placed corrugated furnaces, a combustion chamber at the rear and tubes running forward from the combustion chamber to the front of the boiler, whence the gases pass through the uptakes to the smokestacks. Owing to the large size of the shell, Scotch boilers are made of excessively thick steel and consequently are entirely lacking in flexibility. They are, therefore, liable to give trouble due to expansion strains from change in temperature and are successful only where the load is absolutely steady as it is on ordinary merchant ships.

In the navy water tube boilers are used exclusively and these are coming into use more or less in the mercantile marine as well.

Water tube marine boilers are built as modifications of both the B. & W. and the Heine types, the tubes being shorter and smaller in diameter than is the case in stationary boilers and the boilers being encased in steel, lined with light insulating material inside, instead of being set in brick.

For torpedo boat destroyers and other small high speed craft, boilers of the Thornycroft type are used, which consist of a large number of very small diameter tubes expanded into upper and lower drums somewhat similar in general type to the Stirling stationary boiler. These boilers are extremely light and are rapid steamers which are necessary characteristics of boilers for high speed boats.

A NEW USE FOR THE ELECTRICAL PUMP

Another use for the electrical pump is coming to the front. The drainage of irrigated lands differs from the drainage of wet lands generally in that it is undertaken to protect or reclaim from injury lands which have been reclaimed from their naturally desert condition at considerable expense and have been productive. The drainage of such land means not merely an addition to the productive area but the saving of the original investment in such land in the form of which it is a part and in the water supply for irrigation. Practically every valley where irrigation has been carried on for any considerable length of time has lands in need of drainage. Several classes of land in the irrigated section require artificial drainage in order to be fitted for crop production. This may serve as a tip for added electrical loads now utilized in irrigation districts. Farmers' Bulletin 805 of the U. S. Department of Agriculture entitled, the Drainage of Irrigated Farms will be found most helpful for suggestions along these lines.

SPARKS—Current Facts, Figures and Fancy

(Electricity is playing the leading role in present day world problems. As to how economies are being effected by its use and new possibilities of victory assured by its further development the reader will glean from the briefs on this page. Other interesting notations on world events and progress of the industry will also be found in the following notations.—The Editor.)

Even the method electrical has invaded the ballot system. The Argentine Embassy at Washington announces that bids are invited by the Argentine government for the designing, manufacture, and installation of an electrical voting machine for the Chamber of Deputies of Argentina.

* * *

It is not yet too late for the Federal government to avert the threatened fuel famine in California, but relief legislation must be enacted quickly if disaster is to be avoided. This is the view of well informed captains of industry in the Golden State who say that consumption of crude oil in California is now sixty thousand barrels a day above production.

* * *

English technical journals are advocating the development of the water powers in the British Isles as the means of a possible saving of twenty thousand tons of coal a year. Think of six millions of barrels of oil that can be immediately saved in California alone by reasonable legislation on water power as set forth in the Journal of Electricity August 1, 1917!

* * *

The State of California is a good farmer. A cow owned at the state farm yielded 94 pounds of butterfat during the month of June. Possibly the electrical appliances available on the farms of the West may even be reflected in the contentment of cows and their consequent increased yield. Ask the power salesman, he knows.

* * *

Herbert Hoover's six big requests for food conservation are to eat one wheatless meal a day; to eat beef, mutton or pork not more than once a day; to economize in the use of butter; to cut the daily allowance of sugar in tea or coffee and in other ways; to eat more vegetables, fruit and fish; and to urge in the home or the restaurants frequented the necessity of economy.

* * *

It is interesting to note that the Argonaut mine, located on the Mother Lode at Jackson, Amador County, and supplied by electric service from the Pacific Gas & Electric lines, has the distinction of having the deepest shaft of any gold mining property on the North American continent, having now reached a total lineal depth of 4667, which corresponds to a vertical depth of 4650 ft.

* * *

The war in Europe is forcing upon the allies the uses of electricity that have long been advocated in the West. The French government has issued a decree prohibiting the use of gas from 8:30 a. m. to 12:30 p. m., from 2 to 5:30 in the afternoon, and from 9 at night until 4:30 in the morning. Electrical engineers

are instructed, says Reuter, to endeavor to find means of substituting electrical energy for steam engines in factories.

* * *

The manganese situation is most encouraging as the United States Geological Survey estimate for the whole year is 80,000 tons of the high-grade ore. This however, is less than 20 per cent of the present large demand of the steel industry. Yet it is significant that the shipments of lower grade manganese ore likewise are record breaking, the 6 months of 1917 considerably exceeding the 12 months of 1916, and the present rate of production promises an even larger tonnage for the remaining 6 months.

* * *

As an instance of the unique work ahead for the engineer, may be cited the recent words of Secretary of War Baker before the Society for the Promotion of Engineering Education: "Nobody knows how long this war is going to last, but we do know that when the war is over the rehabilitation of a stricken, if not paralyzed civilization, is going to be a long-drawn-out and uphill task and there will be need on every hand for trained minds, for trained and schooled men. The day of the engineer will be indeed the big day."

* * *

Present day emergency service of a great utility company is interesting. On July 4th, fire destroyed all the apparatus in the compensator room at Los Angeles number three and two generators burnt up at the Big Creek plant, reducing the hydraulic capacity of the Southern California Edison Company by 32,000 kw. In connection with this latter burn-out it was necessary to get new coils to the plant in the quickest possible time. To do this a one-ton truck with two drivers was dispatched from Los Angeles at noon time with the desired apparatus and arrived at the plant 285 miles distant, at 6:25 a. m., the following morning.

* * *

In a recent article in the Electrical World, Mr. Hugh L. Cooper estimates that if the wasted 35,000,000 h.p. of water power were developed the country would be \$1,241,600,000 the gainer every year, or nearly \$36 per horsepower. Mr. Cooper has made a serious error in his assumptions, according to Engineering and Contracting, for if we capitalize the \$36 at 10 per cent we get \$360 as the value of each horsepower of water rights, which is certainly from four to ten times too great. Nevertheless, it is incontestable that a vast sum is annually going to waste because of injudicious government action, both state and federal, the latter through a restrictive and narrow policy of so-called "conservation," the former through failure to be liberal enough in the rate-making policies.

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CONTENTS

The Electrical Winning of Inspiration Copper. <i>By A. H. Halloran</i>	147
Metal Flume and Its Value from an Economical Standpoint.	155
Water Works and Its Bearing on Rate Fixing. <i>By C. E. Grunsky</i>	156
A New Electrical Feature of the Portland Rose Carnival... ..	159
A Radio Station in Salvador. <i>By J. W. Finch</i>	160
Conclusions on Heat Insulating Materials. <i>By John Crawford, Jr.</i>	162
Riverside Discussion on Heat Insulating Materials. <i>By John Crawford, Jr., Stanley I. Walton and J. M. Morris</i>	164
The Plot of Advertising. <i>By H. A. Lemman</i>	165
Size of Service Wires for a Group of Motors. <i>By F. D. Weber</i>	168
Reservoir Capacity for Small Pumping Plants. <i>By S. T. Hording</i>	170
A Rival to X-Rays	172
Chemistry of Man	172
Phases of the Electrical Contractors' Business. <i>By H. C. Reid</i> ..	173
Helpful Notes on Interior Telephone Systems. <i>By George A. Schneider</i>	176
Boiler Classification in Fuel Oil Practice. <i>By Robert Sibley and Chas. H. Delany</i>	178
A New Use for the Electric Pump.....	180
Sparks—Current Facts, Figures and Fancy.....	181
Editorials	182
Personals	185
Builders of the West—X. <i>E. C. Jones</i>	185
Electrical Supply Jobbers' Association Convention.....	187
Recent Happenings in the Industry.....	189
A Review of Recent Bulletins.....	192
What Western Inventors are Doing.....	193
New Electrical Developments.....	194

SUCCESS IN ORGANIZATION

When in the running of the affairs of a nation, or in the building of an executive organization, or in the grouping of the family responsibilities, or in the harmonizing of Capital and Labor, or even in the daily routine of each human life, it becomes a recognized fundamental of human activity that responsibility and authority are as inseparable as the feldspar, mica and quartz that make the strength of the granite, then indeed may such effort be said to be in line for its due measure of success.

PUBLISHER'S ANNOUNCEMENT

W. M. Deming has joined the managerial staff of the Journal of Electricity as Vice-President and Business Manager of the Technical Publishing Company. After 29 years of service with the General Electric Company Mr. Deming, as announced in the technical press throughout the country, resigned his position the first of the year, in order to come to the Pacific Coast for a much needed rest and recreation.

He has become so thoroughly imbued with the life, the spirit, and the enthusiasm of the Great West that he has decided to remain with us and this announcement of his connection with the Journal of Electricity constitutes the greatest single advance ever made in the forward progress of the Journal.

We confidently feel that his helpful presence in the affairs of the electrical industry throughout the West means much for the continued prosperity and growth of the Journal in its contribution of usefulness to the nation.

There is no denying the fact that an increasing sense of optimism is being felt throughout the West.

Why it Looks Good in the West

While much of the gigantic industrial activity that is going on may be directly traceable to war orders, still those who look deeper realize that the wheels of industry that are now being set in motion have a permanent tinge to them.

The West has long needed manufacturing and industrial growth to give balance to its vast agricultural and water power resources. It is fully realized that every resource of the nation is pledged—life and soul—to bringing a successful termination to the present world war and in its contribution to this task the West is giving of its all.

But the dark war cloud certainly has its silver

lining. Out from beneath its apparently dark and grewsome forebodings, men of constructive vision see a tremendous era of commercial and engineering activity ahead, unrivalled in its splendor.

The lesson of the war is a timely one for development in the great Pacific Area. The realization that domination must cease in all commercial and engineering activity of the future, the part that Western effort must perforce play in the era ahead will be in the spirit of co-operation and helpfulness in assisting foreign neighbors of the Pacific Area in their forward moves.

So apparent is this call to the new West and so fascinating are its allurements that manufacturers, manufacturers' agents and engineers are already laying their plans in these strenuous times to be ready on the morrow for this new era of commercial and engineering activity as its reactive force will be felt throughout the West in vastly forwarding its industries and the development of its natural resources.

The interest that is being shown in all quarters looking toward a goodly attendance at convention gatherings that are scheduled for September is most gratifying.

The Conventions in September

A special car from California via Portland to the Spokane convention of the Northwest Electric Light & Power Association is now assured. It is hoped that it may prove to be a special train such is the enthusiasm that prevails.

A convenient arranging of the dates of other conventions of the month has been so prepared as to avoid conflicts the one with the other. Thus the British Columbia Association of Electrical Contractors and Dealers has its convention at Vancouver, B. C., September 10 and 11; the Northwest Electric Light & Power Association convenes at Spokane, Wash., September 12, 14 and 15; and the Oregon Association of Electrical Contractors & Dealers holds forth at Eugene, Oregon, September 17 and 18. Hence it is possible for those who so desire to go the round of the circuit and attend them all.

In these times of tense activity it is well that men of the industry get together and discuss matters of grave and timely interest to all. The Journal of Electricity bespeaks a goodly and enthusiastic attendance for them all.

In the continued struggle between the municipally owned and privately owned utility the public often is forced to undergo inconveniences that not only frequently prove nuisances but at times a menace to its welfare and safety.

When Patience Ceases to be a Virtue

The congested condition of the traffic in the main business arteries of the larger cities of the West is itself a problem difficult of solution even with a free hand to proceed in an investigation unhampered by local influences and color.

Take for instance the traffic situation on the principal business thoroughfare of one of the larger cities of the West at the present time. This thronged street already has four parallel tracks through several blocks of its congested district and yet it is now proposed to force upon the city an extension of this hazardous and unscientific system for many blocks further.

As to how long the people will stand for such unwise and unsafe procedure remains to be seen, but certainly there is a point where patience ceases to be a virtue. In such questions as these engineers of the West, skilled in analysis and methods of public betterment, should exercise every influence possible to see that the issue is determined solely on its economic value, devoid of political intrigue, or partisan flavor.

On another page of this issue, Mr. C. E. Grunsky, a well known authority on rates, in a notable contribution of articles to the Journal of

The Raising of Rates on Transportation

Electricity, states that one among many other demands an owner of a utility has the right to make is that it be allowed a share in the general prosperity which this utility has helped to create.

The past semi-monthly period has witnessed a distinct sensation throughout various communities of the West where applications have been filed with the regulatory bodies looking toward a raising of the suburban and interurban transportation rates.

In the past, the travelling public in the West have lauded and praised to the skies the lavish hand with which equipment and service have been installed to serve them.

Many residents can look back to but a few years when the loud puffing steam locomotives and their wornout rolling stock trailed their way through unkempt streets that lined the right-of-way of at least one of these institutions. A half day's travel over the present flower-lined rights-of-way upon the latest design in car equipment in this district today gives a decidedly different appearance to the picture.

It is true that the establishment of zones or the increasing of rates will unbalance the present and future building of communities and their relationship to other districts served. This very fact in itself is proof positive that the utilities involved have helped to create the general prosperity of the communities served and as a consequence they should be allowed a share in this general prosperity.

The regulatory bodies before whom these hearings are to take place have indeed a delicate issue at hand, but it is believed that utmost fairness and a strict adherence to fundamental economic principles of utility regulation will prevail.

Recent consular reports from China show an interesting growth in commercial and engineering relations with the United States. Regardless of the war, the gross trade of Shanghai in 1916 was greater than in any previous year. The direct foreign commerce also surpassed by nearly \$50,000,000 that of 1913, the previous record year. The increase in 1916 was more than \$100,000,000 over 1915 and somewhat less over 1907, a steady advance in trade having continued until war conditions checked it in 1914. This interference has been largely overcome, and further gains in Shanghai's extensive commerce are anticipated. The port transacted more than 42 per cent of the total foreign trade of China in 1916—\$348,689,907 out of \$826,812,672.

In 1916 for the first time the United States took the lead in the aggregate trade between Shanghai and

any one country, England and Japan ranking second and third, respectively. The United States bought more Chinese products in 1916 than any two other countries combined. If ships had been available to transport freight at reasonable rates the total of American-Shanghai commerce in 1916 would have been much greater. During the year many more American manufacturers and exporters established connections in Shanghai and some sent their personal representatives to investigate conditions or to co-operate with their appointed agents. Several prominent American firms opened offices here.

That as much as a half billion dollars worth of coal annually goes to waste in the United States due to inefficient utilization of this great natural resource is easily seen by a comparative study of power plant efficiencies that may be obtained in the larger as compared with the smaller installations. In the larger plants the efficiencies may be as high as 15 to 18 per cent while in the small power station the efficiency drops below 10 per cent. According to the director of the U. S. Bureau of Mines there was mined in the United States last year the enormous total of six hundred million tons of coal, the greatest production ever witnessed in the world. A study of average plant efficiencies the country over reveals the fact that their average efficiency is only somewhere in the neighborhood of 5 or 6 per cent. Thus it is easily seen that were it possible to elevate the average efficiency to something near the maximum now attainable in steam plants about three times as much energy would be available for the productive industries of the country.

This study of conservation of fuel becomes especially interesting when conditions in the West are carefully noted. Fuel oil is used universally in this district when steam power is necessary to be used as an auxiliary to hydroelectric power.

A perusal of the economic results set forth in the leading article of this issue on the Inspiration Copper Company is interesting. This plant is producing the remarkable result of an average net efficiency of the boiler and economizer, even after deducting the steam used for atomizing, of 82.9 per cent. A twelve month average of nearly 286 mean kw.-hrs. per barrel of oil

is shown in the power plant statement, and an overall thermal efficiency of the plant as a whole for last December with a machine load factor of 82.5 per cent was 16.32 per cent. On the other hand a recent power plant statement from the new Ajo power plant in Arizona, indicates 312 kw.-hr. per barrel of oil and consequently an even larger over all efficiency.

That these larger stations are thus able to produce such vastly better economic results than the smaller plants points clearly to the necessity of gigantic networks of interconnection in every manner reasonably possible. It means utilization of hydroelectric power in its highest development and when this is exhausted, the burning of fuel.

The unfortunate experience encountered due to the non-lining of certain of the tunnel work along the Los Angeles Aqueduct first led engineers to question the advisability of ever again undertaking the completion of permanent work of this character without properly lining the tunnel bore with concrete.

The building of the mammoth Twin Peaks tunnel, now recognized as the largest and longest tunnel ever undertaken in a municipal effort, has enabled engineers of the city of San Francisco to study the economic factors that enter into concrete lining.

An interesting application of their deductions is found in a careful study of the proposed tunnel work for the Hetch Hetchy project soon to be let under contract. Nearly nineteen miles of this work are now being advertised and although the alignment passes through some of the hardest and most durable of rock formations, still the work is to be concrete lined throughout.

When it is considered that nearly twice the area of cross-section must be excavated in order to concrete a tunnel of the dimensions proposed, one is at first led to speculate as to why the extra expense. It is said, however, that careful experiments have led the city's engineers to the conclusion that the extra friction of the unlined tunnel would cause such an increase in tunnel section as to make the concrete lined tunnel of more economic value even when all other resultant desirable factors of the concrete lining is not taken into consideration.

THE NEW JOURNAL SERVICE: In line with its whole-souled ideal of service to the electrical industry in the West, the Journal of Electricity has furnished a room in its suit of offices at the Crossley Building in San Francisco, which it will reserve for the especial use of its readers and friends who happen in at its headquarters from time to time. It is sincerely hoped that all visitors, either from the East or from any of the territory it serves in the West, will not fail to add their name to the register of guests that is being kept and that all will co-operate with the Journal in this move, for furthering the splendid esprit de corps that is now so firmly entrenched among men of the electrical industry in the West.

In editorial matter for the coming issues, especial emphasis is to be laid upon the doings of electrical men in the great northwest and the forthcoming convention at Spokane. Full details in the next issue will be given concerning the convention. The issue of September 15, 1917, will contain a beautifully illustrated article on the Bunker Hill & Sullivan mine, which is to be the feature for visitation during the convention.

The articles on rates by C. E. Grunsky, the well-known consulting engineer, which are receiving such favorable comment in the technical press, will be continued from a new phase of discussion in the issue of September 1, 1917, and for several issues thereafter.

Other departments will be continued with especial attention in adaptation to the needs of the immediate present in the electrical industry.

PERSONALS

O. B. COLDWELL, superintendent of the Portland Light & Power Company, as the chairman of the executive committee of the Northwest Electric Light & Power Association, is actively engaged in arranging for the many details that have to do with the success of the forthcoming convention of the association in Spokane, September 12-15, 1917. As a past president of the association, Mr. Coldwell has long been an active figure in the advance of the electrical industry in the Northwest.



During the Riverside convention of the Pacific Coast Section, N. E. L. A., he was the official guest from the Northwest and it is largely due to his cordial presence at this gathering that so much interest has been aroused in returning a goodly attendance of visitors from the states to the south to the Spokane convention.

A. H. Halloran, formerly managing editor of the Journal of Electricity, has been appointed assistant business manager.

J. F. NePage, of NePage, McKinney Company, electrical engineers and contractors of Seattle, recently made a business trip to San Francisco and Portland.

Theo. N. Vail, president of the American Telephone & Telegraph Company, is a recent visitor at San Francisco and attended the high jinks at Bohemian Grove.

J. H. Prior, formerly chief engineer, Illinois Public Utilities Commission, has left the service of the Illinois Commission to open an engineering office in Chicago.

H. B. Peirce, assistant commercial agent of the Washington Water Power Company at Spokane has resigned his position in order to engage in commercial and engineering activity in Russia.

Scott Hendricks of San Francisco, president of the Oregon-Nevada Telephone Company, has accepted service with Herbert Hoover in his food control administration work during the period of the war.

C. B. Merrick has resigned his position in the distribution department of the Pacific Gas & Electric Company to accept service with the research department of the Rieber Laboratories of San Francisco.

F. W. Gay, a consulting engineer of San Francisco and the Pacific Coast Correspondent of the J. G. White Engineering Corporation, is again back at San Francisco after an extended business trip in the East.

A. R. Thompson, in charge of the distribution department of the Pacific Gas & Electric Company, in San Francisco, has resigned in order to accept a position as captain in one of the engineer regiments of the United States Army.

T. W. Simpson, western manager of the Federal Sign System (Electric) is again at his San Francisco office, after a delightful trip to St. Joseph, Mo., where his company held a recent business and social gathering of its district managers.

T. C. Roberts, chief engineer of the United Verde Copper Company and of the United Verde & Pacific Railway Company at Clarkdale, Arizona, has been transferred to the grade of member in the American Institute of Electrical Engineers.

A. G. Wishon, general manager of the San Joaquin Light & Power Company, is a recent San Francisco visitor, and reports that two new hydroelectric plants of his company on

the Kern River will be placed in operation within the next thirty days.

M. F. Steel, Pacific Coast manager of the Benjamin Electric Manufacturing Company, has left for Chicago and will return westward again in time to go direct to the convention of the Northwest Electric Light & Power Association at Spokane in September.

Ray W. Turnbull of the General Electric Company's office at Portland, is a recent San Francisco visitor and reports that continued live interest is being shown in the Northwest in heating appliances and their relationship with central station advance in the Northwest.

E. P. Warner, formerly chief engineer of the Chicago works of the Western Electric Company, now a resident of San Diego, is a recent San Francisco visitor. Mr. Warner was one of the judges of awards at the World's Exposition in Chicago in the class of heating and welding.

J. C. Carlson of the Central Electric Company has returned to San Francisco from a six weeks' visit in the East during which journey he had an interesting interview with **W. L. Goodwin**, formerly of the Pacific States Electric Company and now engaged in forwarding co-operative work among the electrical contractors in New York City.

Newcomb Carlton, president of the Western Union Telegraph Company, is a visitor on the Pacific Coast. Mr. Carlton was a much interested spectator at a recent spectacular review of many of his company's men now training in the signal corps battalion at Monterey Presidio under the command of Major **A. H. Griswold**, formerly plant engineer of the Pacific Telephone & Telegraph Company.

J. A. Lighthipe, electrical engineer for the Southern California Edison Company, has made unusual progress in safety engineering for his company. The number of accidents of any serious moment has been reduced enormously during the past two years. There was but one fatal accident last year, and this was due more to the physical condition of the man than to anything else, he having a weak heart.

BUILDERS OF THE WEST—X



E. C. JONES

The discovery of such vast resources of crude petroleum in California as to equal twenty-five per cent of the world's output in this product, led engineers of the West to formulate new uses and originate new inventions for its economic utilization in the industries and in the domestic life of the West. To **E. C. Jones**, chief gas engineer of the Pacific Gas & Electric Company, must be recorded the credit of an ingenuity in gas engineering that places him pre-eminent as a Builder of the West in this field of endeavor.

But the younger generation gains especial inspiration by recalling as a motto for higher effort the beautiful words of Mr. Jones at the San Diego Convention of the Pacific Coast Gas Association: "A man may be said to have acquired success when he has helped another attain what he himself has missed."

Emmett Callahan, Jr., of Broadman, Oregon; G. G. Fitzgerald, Ventura County Power Co.; J. L. Frye, of Bisbee, Ariz.; D. W. McCleery, of NePage, McKenny Co., Great Falls, Mont.; G. B. Sanford, of the Great Western Power Co.; William Sydow, Denver, Colo.; W. H. Tolhurst, of the Standard Oil Co.; G. F. Wilson, of the Los Angeles Railway, have been elected associate members of the American Institute of Electrical Engineers.

OBITUARY

George Ey, auditor of the General Electric Company at Los Angeles, passed away Thursday, August 2, 1917.

DIRECTORY

Officers and Committees, Pacific Coast Section National Electric Light Association, 1917-1918

Officers

President, H. F. Jackson, Sierra & San Francisco Power Co., San Francisco.
Vice-president, Samuel Kahn, Western States Gas & Electric Co., Stockton, Cal.
Vice-president, E. R. Davis, Southern California Edison Co., Los Angeles.
Secretary, A. H. Halloran, Journal of Electricity, San Francisco.
Treasurer, A. N. Kemp, Southern California Edison Co., Los Angeles.

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Henry Bostwick, Pacific Gas & Electric Co., San Francisco.
W. W. Briggs, Great Western Power Company, San Francisco.
Wm. Baurhyte, Los Angeles Gas & Elec. Corp., Los Angeles.
George A. Campbell, Truckee River Gen. Elec. Co., Reno, Nev.
D. E. Harris, Pacific States Elec. Co., San Francisco.
H. C. Reid, Pacific Fire Extinguisher Co., San Francisco.
W. P. Southard, Albuquerque Gas, Elec. Light & Power Co., Albuquerque, New Mexico.
F. S. Viele, Prescott Gas & Electric Co., Prescott, Ariz.
K. E. Van Kuran, Westinghouse Elec. & Mfg. Co., Los Angeles.
A. Emory Wishon, San Joaquin Light & Power Corp., Fresno.
A. B. West, Southern Sierras Power Co., Riverside, Cal.

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J. A. Koontz, Great Western Power Co., San Francisco.
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C. O. Poole, Southern Sierras Power Co., Riverside, Cal.
W. C. Hornberger, Pacific Gas & Electric Co., Phoenix, Ariz.
S. J. Lisberger, Pacific Gas & Electric Co., San Francisco.
R. E. Cunningham, So. California Edison Co., Los Angeles.
E. R. Northmore, Los Angeles Gas & Elec. Corp., Los Angeles.

Commercial Committee

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J. B. Black, Great Western Power Co., San Francisco.
H. A. Lemmon, Truckee River Gen. Elec. Co., Reno Nevada.
E. B. Walthall, San Joaquin Lt. & Power Corp., Fresno, Cal.
E. B. Criddle, So. Sierras Power Co., Riverside, Cal.
G. R. McLean, Pacific Light & Power Co., Riverside, Cal.
A. E. Halloway, San Diego Cons. Gas & E. Co., San Diego, Cal.
C. M. Einhart, Roswell Gas & Elec. Co., Roswell, New Mexico.
R. M. Alvord, General Electric Co., San Francisco.
Miles L. Steel, Benjamin Elec. Mfg. Co., San Francisco.
W. S. Berry, Western Electric Co., San Francisco.
M. L. Scobey, Home Electrical Co., San Francisco.
H. L. Aller, Pac. Gas & Elec. Co., Phoenix, Ariz.
H. J. Kister, Los Angeles Gas & Elec. Corp., Los Angeles.

Accounting Committee

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C. D. Reid, Pacific Gas & Electric Co., Phoenix, Ariz.
W. E. Shaw, Jr., Truckee River Gen. Elec. Co., Reno, Nev.
C. E. Twogood, Albuquerque Gas & Elec. Co., Albuquerque, New Mexico.
P. R. Ferguson, So. Sierras Power Co., Riverside, Cal.
A. B. Carpenter, San Joaquin Lt. & Pr. Corp., Fresno, Cal.
R. B. Stith, Western States Gas & Elec. Co., Stockton, Cal.
F. J. Blanchard, Sierra & S. F. Power Co., San Francisco.

Membership Committee

W. L. McKinley, Chairman, Sierra & S. F. Power Co., S. F.
H. S. Batchelder, Western States Gas & Elec. Co., Stockton, Cal.
R. E. Frickey, Northern Cal. Power Co., Redding, Cal.
W. S. Leffler, Great Western Power Co., San Francisco.
W. H. Talbot, San Diego Gas & Elec. Co., San Diego, Cal.
H. N. Sessions, So. California Edison Co., Los Angeles, Cal.
H. P. Pitts, Pacific Gas & Elec. Co., San Francisco.
C. F. Butte, Butte Engineering & Elec. Co., San Francisco.
J. M. Buswell, San Joaquin Lt. & Power Co., Fresno, Cal.
C. A. Kelley, So. Sierras Power Co., Riverside, Cal.
Edward C. Russell, Tucson Gas, El. Lt. & Pr. Co., Tucson, Ariz.
J. B. Mechling, Nevada-Cal. Power Co., Goldfield, Nev.
C. B. Hall, Illinois Electric Co., Los Angeles.
J. R. Buchanan, Silver City Power Co., Silver City, N. M.
E. F. Sells, Albuquerque El. Lt. & Pr. Co., Albuquerque, N. Mex.
Paul V. Quick, Landers, Frary & Clark, San Francisco.
B. G. McBride, Elko-Lamoille Power Co., Elko, Nev.
R. S. Arthur, Douglas Traction & Lt. Co., Douglas, Ariz.
J. C. Rendler, So. Cal. Electric Co., Los Angeles.
J. E. Cornell, The Arizona Power Co., Prescott, Ariz.
A. E. Youngholm, Elec. Ry. & Mfrs. Supply Co., San Francisco.

H. E. Sanderson, Bryant Electric Co., San Francisco.
A. B. Day, Los Angeles Gas & Elec. Co., Los Angeles.
J. V. Case, General Electric Co., Los Angeles.
Robert Sibley, Journal of Electricity, San Francisco.
A. E. Morphy, So. Cal. Edison Co., Los Angeles.
R. S. Masson, Arizona Power Co., Prescott, Ariz.
Geo. B. Furniss, Pacific Gas & Electric Co., Oakland, Cal.
W. S. Coleman, Pacific Gas & Electric Co., San Francisco.
L. F. Galbraith, Pacific Gas & Electric Co., San Francisco.
R. E. Fisher, Pacific Gas & Electric Co., San Francisco.
R. M. Alvord, General Electric Co., San Francisco.
C. A. Luckenbach, Los Angeles Gas & Elec. Corp., Los Angeles.

Pacific Coast Gas Association Convention

The executives of the Pacific Coast Gas Association in preparing for the 25th annual convention at Santa Cruz, September 18-21, 1917, are displaying unusual activity looking toward the most successful gathering ever held by this association, so well known for its helpful "get-togethers." This enthusiasm is best displayed by recounting the happenings of the last quarterly round-up in Los Angeles.

The Pacific Coast Gas Association held its second annual get-together dinner of the present season at the Hotel Alexandria, Los Angeles, on the evening of Saturday, June 9th.

It was in every respect a representative gathering of leading lights of the gas industry on the Pacific Slope. The "Pacific Service" contingent consisted of Messrs. Henry Bostwick, Van E. Britton, John A. Britton Jr., Leon B. Jones, W. M. Henderson, M. L. Neely and F. S. Myrtle. As was natural, the large majority of the attendance hailed from the southland, the Los Angeles Gas & Electric Corporation being notably well represented. There were present also a number of appliance men, a branch of the industry that is steadily augmenting its membership in the association. Altogether, an assemblage of one hundred and thirty-two gathered at the dining tables spread in the spacious hotel ballroom.

President C. B. Babcock was in the chair. During dinner some attractive "stunts" were pulled off by fair local entertainers, who sang and danced charmingly. A prominent feature of the vocal part of the entertainment was the new patriotic song "We'll Stand by Uncle Sam," the music of which was composed by a "Pacific Service" man, H. G. Ridgway of the Marin district. After dinner came the speech-making program, led off by Mr. Henry Bostwick, the association's able and energetic secretary. It was cheering to note the receipt of thirty-one new applications for membership into the association, and loud applause greeted Mr. Bostwick's announcement of the decision of the executive committee to hold the convention at Santa Cruz this year according to schedule and not follow the action of some Eastern organization in postponing their annual gatherings on account of the war.

Mr. Wm. Baurhyte, who with Champ Vance headed the Los Angeles Gas & Electric Corporation's contingent, spoke words of welcome in his usual happy way. Then, in order, followed John A. Britton Jr., of "Pacific Service," editor of the Wrinkle department; A. B. MacBeth, Southern California Gas Company, Los Angeles, chairman of the Advisory Board; Paul Overton, Los Angeles Gas & Electric Corporation, chairman of the Legislation and Taxation Committee. All reported progress. B. S. Pederson, San Francisco, chairman of the Gas Exhibits Committee, told of the arrangements made for a representative exhibit at Santa Cruz this year. Paul Haugh, Los Angeles, told some clever stories. Leon B. Jones, of "Pacific Service," member of the executive committee, spoke of the progress of the gas industry and its prospects. F. S. Myrtle, "Pacific Service," reported for the Committee on Publicity. F. S. Wade, Southern Counties Gas Company and C. A. Luckenbach, Los Angeles Gas & Electric Corporation, both directors of the association, closed the speech making. Mr. Luckenbach amid great applause presented a paper read by him to the employees of his company on the subject of the Liberty Loan bonds, in which he urged quality as against quantity in measuring patriotic support and scorned the "financial slacker."

ELECTRICAL SUPPLY JOBBERS' CONVENTION

(The gathering of men of the electrical industry at Del Monte during the past semi-monthly period has been remarkable in that a high degree of comradery has been developed that is bound to have lasting results in even more helpful co-operative effort for the future. The golf tournament for the Red Cross which netted the national organization a hundred and ten dollars, gave a distinctly unselfish and patriotic tone to the gathering. The papers presented were unusually well written and a renewed spirit of loyalty was awakened.—The Editor.)

The mid-summer convention of the Pacific Coast Electrical Supply Jobbers' Association at Del Monte July 27-28-29, 1917,



GARNET YOUNG, of the Telephone Electric Equipment Co., whose paper on "Loyalty" and whose excellent golfing won him distinction at the convention.

proved to have an unusual amount of ginger in the discussions, especially the open meeting on Saturday, July 29. In the unavoidable absence of Cap. H. F. Jackson, president of the Pacific Coast Section, N. E. L. A., who was to have delivered the paper of the meeting, Garnet Young of the Telephone Electric Equipment Co., San Francisco, delivered a paper on "Loyalty." Mr. Young brought out certain points wherein it was hinted that the manufacturer was not getting the full co-operation of the jobber, especially in certain lines of wire distribution to the trade. The jobber's viewpoint was ably defended by Tracy E. Bibbins of the Pacific States Electric Company who thus summarized the full defense of the ethics of the jobber in the following creed:

THE JOBBERS' CREED

That at all times I must be loyal to myself—my company and its policies.

That I should consistently support the manufacturer whose lines I have agreed to sell.

That every manufacturer who plays the game, whether I buy from him much, or little, should have from me all reasonable encouragement, and always a fair deal.

That I recognize the right of my competitor to live and prosper and no policy should be employed by me which is destructive to his rights.

That my first and last thought should be for the betterment of the electrical industry and the service to all my customers.

Such a house cleaning as resulted both in open expression at the meeting and in the individual thoughts of each person present will do much for a clearer and more open understanding between manufacturer and jobber for the future.

An unusual amount of good fellowship pervaded all the meetings at Del Monte, and the various golf tournaments were no exception. But to properly describe the good times enjoyed one must be present with them and mingle in their gatherings. Here are some of the incidents that gave life and enthusiasm to this meeting:

When John J. Gibson, manager of the supply department of the Westinghouse Electric & Manufacturing Company and a distinguished guest of the convention, spoke feelingly of dear little "seven toed Pete" and offered to take him back to East Pittsburg and there give him proper nourishment, a distinct feeling of sadness swept over those present for this little animal, the only one now in captivity, is dearly loved by the electrical jobbers.

And then there was Frank Fagan, western manager of the Edison Lamp Works of the General Electric Company, whose skill as an agriculturist in the growing of potatoes was bulletined on the main news board at the Del Monte. Secret investigation will undoubtedly reveal the fact that Mr. Fagan in some secret and mysterious manner is producing forced growth in potato culture by means of the Mazda lamp.

* * *

The Jobbers' Golf Tournament, around which always centers such keen interest in the race for the beautiful cup that is offered from year to year, was won by Colonel Samuel H. Taylor of the Electric Railway & Manufacturers' Supply Company, San Francisco, with a gross score of 104 and a net of 59. This conquest was peculiarly fitting in this instance, for Mr. Taylor is deserving of extra distinction at the hands of the Jobbers in that his present term as president of their organization is proving unusually helpful and profitable to all.

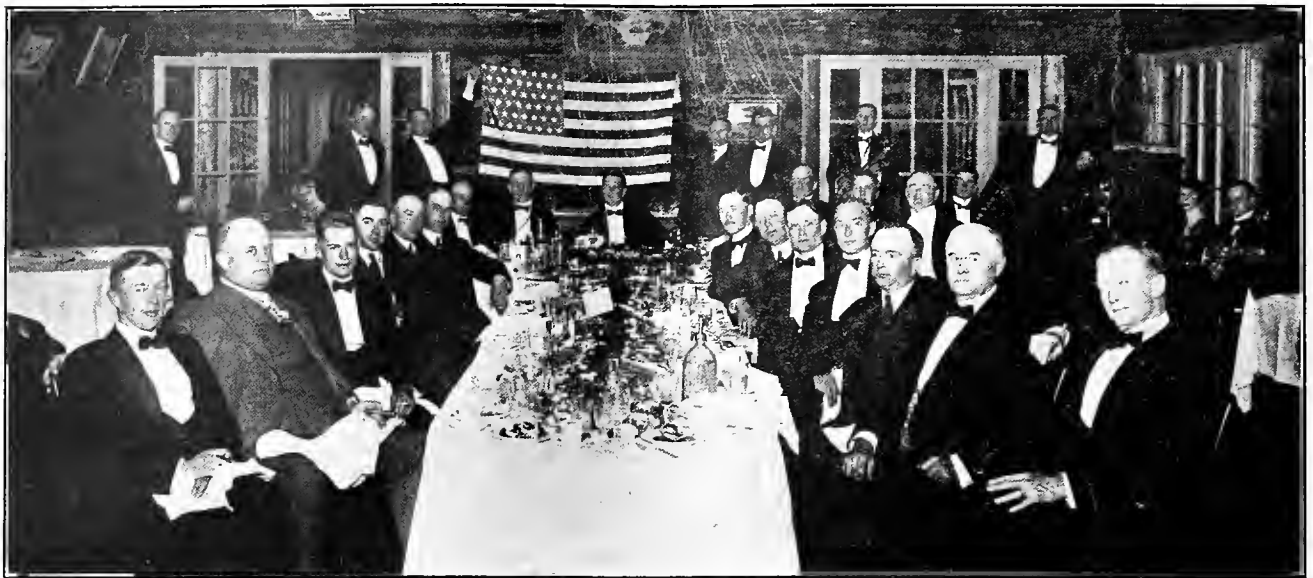
* * *

Garnet Young of the Telephone Electric Equipment Co., distinguished himself by knocking his golf ball up a tree from whose lofty branches he was enabled to see the nations of the world and by means of this enlarged vision he became monarch of all he surveyed and as a consequence won the manufacturers' cup with a net score of 64 and a gross of 84.



TRACY BIBBINS, PRESIDENT OF THE PACIFIC STATES ELECTRIC COMPANY

Mr. Bibbins, in his characteristically able manner, sounded the keynote of the convention in his terse, well-worded rule for men of the association by the presentation of "The Jobbers' Creed," which is presented elsewhere on this page of the Journal.



Standing at Left of Flag, A. M. Irwin, John J. Gibson

Standing at Right of Flag, W. R. Dunbar, C. B. Hall

Sitting at table, from left to right: H. H. Hoxie, P. J. Aaron, C. D. La Moree, Ray Murphy, Carl Will, L. W. Davis, Hugh Bargion, Samuel H. Taylor, Carl E. Heise, C. N. Aspinwall, W. C. Wurfel, Wm. Dick, Carl Wernicke, F. N. Averill, Samuel Adams Chase, C. B. Hawley.

At right of rear of table, sitting: A. Youngholm, R. E. Van Kuren, R. F. Behan.

THE BANQUET OF THE WESTINGHOUSE GATHERING

One of the pleasing features of the recent gathering of the electrical Supply Jobbers' Association at Del Monte was the meeting of men of the West engaged in directing the affairs of the Westinghouse Electric & Manufacturing Company. The presence of John J. Gibson and Samuel Adams Chase from the Eastern offices added an agreeable tinge of dignity and spirit of good fellowship throughout the meetings both of the Westinghouse men and of the Jobbers' Association.

A beautiful and patriotic strain pervaded the convention doings. A golf tournament was played for the benefit of the Red Cross in which each entryman chose his own handicap and paid two dollars for the privilege. F. J. Airy, Los Angeles manager of the Pacific States Electric Company, and C. B. Hawley of the Intermountain Electric Company of Salt Lake City, each with a net of 72 and a gross of 122, tied for first place. The tie score was played out on Saturday and Mr. Airy won the beautiful gold Red Cross pin given as first prize. The total sum turned over to the Red Cross from this thoughtful and unselfish gift of the Jobbers was one hundred and ten dollars.

* * *

Mr. Hawley and his pal, R. S. Folland, of the Capitol Electric Company, Salt Lake City, were not to be downed, however over the results of the Red Cross tournament. Mr. Folland ably assisted by Mr. Hawley gave a demonstration during the evening of the banquet of why the lake level of the great Salt Lake is said to be slowly receding.

* * *

The Central Station's cup, a gift of the jobbers, was won by Geo. C. Holberton of the Pacific Gas & Electric Company, who played a gross score of 94 with a net of 66. Mr. Holberton's only rival, Stanley Walton of the Pacific Gas & Electric Company, received his reward on the evening of the banquet by being placed in a distinguished position among the jobbers by means of the graceful assistance of the giant, H. E. Sanderson, of the Bryant-Perkins Co. of San Francisco.

* * *

Charlie Hillis, of the Electric Appliance Company, of San Francisco, was the graceful recipient of a pair of beautiful silk garters for his golfing in the future, while Colonel Samuel H. Taylor of the Electric Railway & Manufacturers' Supply Company of San Francisco, will in future have the timely assistance of a model H curry comb to enliven the growth of beard he has carried with him for lo these many years.

* * *

To sum it all up, Ira J. Francis, of John Roebing's Sons Company, of San Francisco, proved himself brim full of humor and an excellent toastmaster. To turn the tables

upon Mr. Francis it might well be said that while what he discussed so fluently pro and con was in itself 5 per cent pro and 95 per cent con, still it is safe to say the jobber and manufacturer will in the future co-operate on a 50-50 basis, each receiving for himself a "5" with its necessary goose egg to make it "fifty fifty" in its truest sense.

* * *

It was a thing of beauty and a joy forever to behold the manufacturers' talent that graced the honor table at



IRA J. FRANCIS, Western Manager of John A. Roebing's Sons Company, who proved himself an able and witty toastmaster and added much to the life of the convention.

the banquet with Ira J. Francis of John Roebing's Sons Company forming the graceful setting of a dozen bouquets, the gift of the jobbers present, and protected by a body guard of a dozen manufacturers on either side with Samuel A. Chase, the assistant to the manager of the supply department of the Westinghouse Electric & Manufacturing Company at East Pittsburg, bringing up the extreme right wing.

* * *

W. S. Berry, the dignified salesmanager of the Western Electric Company, was presented with a windshield of plate glass, 2 by 5 ft., in order that the future growth of beard under his lower lip may proceed free from the interruption of the elements without.

* * *

Attendance at the Del Monte Convention

F. N. Averill, Fobes Supply Co., Portland.
P. J. Aaron, Fobes Supply Co., Seattle.
F. J. Aspinwall, Westinghouse Elec. & Mfg. Co., Seattle
F. J. Airy, Pacific States Elec. Co., Los Angeles.
R. N. Alvord, General Electric, San Francisco.
C. G. A. Baker, Baker-Joslyn Co., San Francisco.
T. E. Burges and wife, Baker-Joslyn Co., Los Angeles.
D. J. Butts, Western Elec. Co., Los Angeles.
N. A. Bowers, McGraw-Hill Pub. Co., San Francisco.
F. G. Beck, American Everready Co., San Francisco.
R. F. Behan, Western Electric & Mfg. Co., San Francisco.
H. L. Borgion, Montana Elec. Sup. Co., Butte.
T. E. Bibbins, Pacific States Elec. Co., San Francisco.
W. S. Berry, Western Electric Co., San Francisco.

E. M. Cutting, Edison Storage Battery Co., San Francisco.
 J. N. Colkitt, John A. Roebling's Sons Co., Los Angeles.
 R. B. Clapp and wife, Manufacturers' Agent, Los Angeles.
 Samuel Adam Chase, Westinghouse Elec. & Mfg. Co., East
 Pittsburgh.
 W. R. Dunbar, Westinghouse Elec. & Mfg. Co., San Francisco.
 L. W. Davis, Westinghouse Lamp Co., Los Angeles.
 W. M. Deming, Journal of Electricity, San Francisco.
 C. C. Davis, Pacific Hardware & Steel Co., San Francisco.
 R. J. Davis, Century Elec. Co., San Francisco.
 Albert H. Elliott, Secretary Electric Supply Jobbers, Associa-
 tion, San Francisco.
 R. S. Folland, Capitol Elec. Co., Salt Lake City.
 Ira J. Francis and wife, John A. Roebling's Sons Co., S. F.
 F. D. Fagan, General Electric Co., San Francisco.
 C. H. Gilson, Gilson Elec. Sup. Co., Oakland.
 S. W. Gilman, John A. Roebling's Sons Co., San Francisco.
 S. B. Gregory, Arrow Elec. Co., San Francisco.
 John J. Gibson, Westinghouse Elec. & Mfg. Co., East Pittsburgh.
 C. E. Heise and wife, Westinghouse Elec. & Mfg. Co., S. F.
 Geo. C. Holberton, Pacific Gas & Electric Co., San Francisco.
 H. H. Hoxie, Electric Ry. & Manufacturers' Supply Co.
 C. B. Hall, Illinois Elec. Co., Los Angeles.
 C. B. Hawley, Intermountain Elec. Co., Salt Lake City.
 C. C. Hillis, Electric Appliance Co., San Francisco.
 D. E. Harris, Pacific States Elec. Co., San Francisco.
 O. W. Lillard, Gould Storage Battery So., San Francisco.

C. D. La Moree, Westinghouse Elec. & Mfg. Co., Los Angeles.
 E. H. Murray, National Carbon Co., Los Angeles.
 J. G. Miller, Gilson Elec. Supply Co., Oakland.
 Ray Murphy, Westinghouse Lamp Co., San Francisco.
 Chester Manchester, Interstate Elec. Novelty Co., San Francisco.
 C. F. Mason and wife, Pacific Tel. & Tel. Co., Los Angeles.
 G. L. Orman and wife, Pacific States Electric Co., Portland.
 J. G. Pomeroy and daughter, Bryant-Perkins Co., Los Angeles.
 F. J. Quinn, Manhattan Elec. Supply Co., San Francisco.
 D. Reynolds, Graham-Reynolds Co., Los Angeles.
 H. E. Sanderson, Bryant-Perkins Co., San Francisco.
 H. B. Squires, H. B. Squires Co., San Francisco.
 Miles Steel, Benjamin Elec. Mfg. Co., San Francisco.
 A. E. Sugden, Pacific Hardware & Steel Co., San Francisco.
 Robert Sibley, Journal of Electricity.
 E. B. Strong, Journal of Electricity, San Francisco.
 Samuel H. Taylor, Elec. Ry. & Manufacturers' Sup. Co., S. F.
 J. A. Vandegrift and wife, Mazda Lamp Division, Oakland.
 K. E. Van Kuren, Westinghouse Elec. & Mfg. Co., Los Angeles.
 C. E. Wiggin, Dunham, Carrigan & Hayden, San Francisco.
 S. V. Walton, Pacific Gas & Electric Co., San Francisco.
 Carl L. Wernicke, Westinghouse Elec. & Mfg. Co., Portland.
 C. M. Will, Fobes Supply Co., Portland.
 W. C. Wurfel, Westinghouse Lamp Co., San Francisco.
 H. F. Yost, Trumbull Elec. Mfg. Co., San Francisco.
 Garnet Young, Tel. Elec. Equipment Co., San Francisco.
 F. J. Zorn, Pacific States Elec. Co., Seattle.

W. S. Berry



Samuel H. Taylor



Charlie Wiggin



Chin of W. S. Berry before the
appearance of his "chinchilla"

"Chinchilla" of Colonel Samuel
H. Taylor which he has
worn since the year one

"Chinchilla" of Charlie Wiggin,
thoroughly concealing his
chin, until his recent
emancipation

THE EVOLUTION OF THE JOBBERS' "CHINCHILLA"

Much amusement was afforded members of the convention by its worthy toastmaster, Ira J. Francis, of John A. Roebling's Sons Company, in presenting W. S. Berry of the Western Electric Company, with a wind-shield to properly protect the growth of beard he has recently started, while to Samuel H. Taylor, of the Electric Railway & Manufacturers' Supply Company, who has for some years prided himself upon a protruding "goe-tee," he presented the latest model of curry-comb. Charlie Wiggin, of Dunham, Carrigan & Hayden, escaped unscathed in that he has long since given up ambitions of maintaining a growth upon his "chinchilla."

RECENT HAPPENINGS IN THE ELECTRICAL INDUSTRY

The Sperry Flour Company is completing its new electric flour mill at Spokane, Washington.

The Tacoma Railway & Power Company, has given its 225 trainmen a raise of one cent an hour. This went into effect on July 15 and is the second raise within the month, two cents an hour having been granted on July 1.

The San Diego Consolidated Gas & Electric Company has commenced rebuilding the electric distribution system at Escondido, Cal. This includes the installation of nine 250 watt lamps on Grand avenue and 104 100-watt lights in other parts of the city.

The Electro-Galvanizing Works at Portland, of which Martin Leiser is proprietor, is now doubling the capacity of the plant. The sum of \$25,000 is represented in the proposed improvements. The name of the company has been changed to the Portland Galvanizing Works.

At a recent luncheon of the Centralia, Washington commercial club, R. Thomas of Portland, president of the Thomas Pulp & Paper Company, announced that his company would soon begin the construction of a power plant at Centralia and a paper mill in Aberdeen. Close proximity to lignite coal was the reason given for starting the power plant at Centralia.

George B. Cooley Electric Company, 813 Western avenue, Seattle, is busily engaged in installing electric lighting plants on twelve 8800 ton ships in the Duthie Yards and is making a large amount of water tight fixtures mostly for shipbuilding companies. A contract for installing light and power equipment in the forge shop of the Pacific Construction and Engineering Company on Whatcom street has been completed. Much armature winding is being done and many orders filled for the company's patented searchlight.

The Public Service Commission of Washington has been informed by the Puget Sound Tracton, Light & Power Company that the tariff providing for the sale of 25 tickets for \$1 on the Seattle division will be canceled and two classes of fares charged beginning August 12. These will be a straight five-cent fare and half rate for school children. The company states that car rides cost more because labor, supplies, power equipment, etc., cost more. Trainmen's wages have been increased fourteen per cent in the past six months, another important item in the increased cost of operation.

An ordinance has been introduced providing for condemnation of right-of-way over which to build an elevated road from First and Washington streets to the Port Commission right-of-way, then down Railroad avenue and on Whatcom and Spokane avenues to the West Waterway. If this is built of wood which is probable, its estimated cost is \$300,000 with \$12,000 additional for sidewalk. Common users on other portions of the line would link up the two divisions of the municipal system. The idea is to bring to a paying basis the municipal lines which since they began operating have been losing money. On a line that would run from the industrial district to Ballard an estimated total daily revenue is available of \$10. This of course will steadily increase as the industrial section develops. This development is taking place very rapidly. The extent to which the city lines would share in this would depend somewhat on the kind of service rendered. It is estimated that by the construction of a little more than four and one-half miles of track and the application of common user to one section of .859 miles, the city would have its more than 18 miles of track in one system and could then test out whether or not it will be possible to make the lines pay.

Suit to Enforce Service

W. V. Tanner, attorney general of Washington has started suit in the superior court of Pierce County, to secure a writ of mandate to compel the Tacoma Railway & Power Company to furnish the citizens of Tacoma with adequate transportation as provided in the franchise under which it operates. The suit is started as the result of the decision of the public service commission to proceed against the company after receiving a ruling from Attorney General Tanner to the effect that under section 93 of the public service law the commission has the power to act. The strike has been on for about two weeks.

Suit Against Traction Company

Suit has been brought against the Puget Sound Traction Light & Power Company for the sum of \$60,917 as its proportion of the cost of constructing the Fremont avenue bridge. Judgment is also requested for interest at the rate of 6 per cent from the date of opening bridge on June 16. The company is also to be compelled if the court so decides to pay \$333 a month as its share of the operation and maintenance of the bridge with one per cent kilowatt hour for current consumption for cars crossing the bridge.

Seattle Wins Point

The city of Seattle in its legal fight to compel the Puget Sound Traction Light & Power Company to resume operations of its street cars won a point when Judge Neterer of the Federal Court remanded to the superior court the city's application for a writ of mandate. The city is asking for a receiver if the company does not comply with the writ. As a result of the decision by the Federal Court, the company will now be compelled to show cause why the writ should not be issued. The company has filed a demurrer to the case of the city, also an answer and the application will be strongly resisted.

The Re-districting of the Southern California Edison Company

From the standpoint of commercial development and with the particular end of supplying the most efficient distribution of electric energy from the various centers of generation and transmission, and to provide and care for consumers collectively and individually, the vast region of the Greater Edison System, has been divided into seventeen geographical districts. In the re-districting of the territory of the original Southern California Edison Company, and that formerly operated by the Pacific Light & Power Corporation, the boundaries of old districts have been changed and four new districts formed.

It is the opinion of Mr. S. M. Kennedy, the general agent of the company under whose direction the important work of re-districting has been conducted, that based upon intimate knowledge of the territories and the communities of each district, that the growth and development of the company's business, in the future, will go even more rapid and satisfactory than was indicated by estimates made eighteen months ago, at which time the proposed merger which has since become a fact, was worked out on paper. More land is being brought under cultivation and more industries are springing up than could be reasonably figured on two years ago.

The Los Angeles district is naturally the center of the Greater Edison system, as the metropolis of the Southwest is the hub around which its wonderful activities revolve. It is in this district that the general offices of the company are located. The new directory census shows the population of the city to be 590,994. The magnificent twelve-story Edison Building, which is in course of construction on Broadway at Third street, will be one of the most attractive structures in the business district. It will be an imposing, but dignified edifice, and a radiant center of illumination at night.

Earnings Western States Gas & Electric Company

Net earnings of Western States Gas & Electric Company for the month of May were \$48,557, a gain of nearly 10 per cent over May, 1916. Recent issue of \$1,564,000 ten-year 6 per cent Notes provides for the retirement of the \$621,500 three-year Notes due October, 1917, and floating debt, and furnishes funds for improvements and extensions to the properties and payment for new water rights and storage reservoirs in California.

Electrical Workers Ask Increase

Local Union No. 77 of the International Brotherhood of Electrical Workers, announcing that it represents the electrical workers employed in the city lighting department of Seattle, has asked the city council for the elimination of the grading of workers and the establishment of a scale of wages for the ensuing year, which averages \$1.00 a day higher than the rate in effect before the recent blanket increase, the high cost of living being the justification. Meter readers under the 1917 budget, received \$85 a month. Since the blanket increase they have been paid \$95 a month; the proposed 1918 scale would give them \$111. The figures for linemen, electrical machinists and inside constructors are \$4.75, \$4.95 and \$5.75; for laborers \$3.00, \$3.50 and \$4.00.

Interlinking the Electric Lines at Seattle

An attempt is being made to secure extensions to the present municipal street car lines in Seattle with a view to connecting them up and sharing in the traffic of some thickly populated districts as well as the chief industrial center of the city.

The plan is to build an extension 1.26 miles in length that will carry Division A from its present north terminus at 13th and Nickerson streets into Ballard. This would cross the Lake Washington canal on the 15th avenue Northwest bridge and tap a densely populated section of Ballard. The estimated cost of this is \$27,320.

Utilities Commission of Idaho

In the matter of the application of Utah Power & Light Company for a certificate of public convenience and necessity in the village of Newdale, Fremont County, Idaho, the commission has ordered the company to continue the furnishing of electrical service.

In the matter of the application of the Shoshone County Power Company, a corporation, for a certificate of public necessity for the exercise of a franchise or transmission line in Shoshone County, Idaho, the commission has granted the request.

Seattle and Tacoma Car Strike

The Puget Sound Traction Light & Power Company and the Tacoma Railway & Power Company have found it impossible to reconcile their differences. The company in Tacoma is running a few cars but so far as Seattle is concerned not a wheel is turning so far as the traction company is concerned. The company has refused to recognize the right of the employees to affiliate with the Amalgamated Association of Street Railway Employees. Both the Tacoma and Seattle car men have flatly declined to accept the company's proposal. The strikers are represented by C. A. Reynolds who in anticipation of the rejection of the offer has telephoned to Henry M. White, federal labor conciliator, asking him to telegraph the department of labor at Washington, D. C., of the apparent deadlock and to recommend that the federal authorities take over and operate the Seattle street railway. Commissioner asked that the proposal be submitted in writing so that it could be included in a report to be telegraphed to the department. It is also reported that the federal government through the commissioner of labor

is negotiating through the Boston office of Stone & Webster for a settlement. There is a possibility that the men at the power plants and sub-stations of the Puget Sound Traction Light & Power Company may strike as there has been a move to this effect.

Suit Against Industrial Accident Commission of Washington

The Washington Water Power Company of Spokane has started suit in Thurston county superior court against the industrial insurance commission to restrain it from collecting premiums either for the industrial insurance or first aid on the ground that the last legislature in enacting the law to exempt steam roads doing an interstate business, included the electric lines doing similar business.

British Columbia Company Proposes Sale to Province

The British Columbia Electric Railway Company has expressed a willingness to dispose of its holding in the province, if satisfactory terms can be secured. This was intimated to the Mayor Vancouver by General Manager Kidd. The price set on holdings on the lower mainland was \$30,000,000. The company is willing to accept bonds to the extent of \$25,000,000 bearing 5 per cent and the remaining \$5,000,000 without interest for five years.

New Business—Seattle District

The Moran Engineering Company, 1220-1222 First Avenue South, Seattle, builders of the Moran centrifugal pumps, of all sizes from one to six inches, have contracts on their books for something like 500 pumps.

Enterprise, Brass Foundry, 2727 Seventh Avenue South, Seattle, has installed the latest equipment in oil burners and cranes which will enable them to handle unusually large work. The plant is loaded up with work that will last several months, much of it being for shipping interests.

Gray & Barash Company, Incorporated, First Avenue South and Jackson street, Seattle, electrical engineers and contractors, have leased a site comprising a block at Horton avenue and Colorado street in the South Canal Waterway addition and will erect a large plant. Extensive orders for electrical machinery and equipment for the numerous ships under construction and proposed has led to this step in order to better handle the business.

Aubry & Wire have just completed a modern electrical installation in the Wright Shipyards at Tacoma. The switches are of the automatic oil type with relays for each motor, doing away with the old fuses.

New Business—Los Angeles District

The new substation at Los Alamitos was put in operation on July 15th. This station has a capacity of 4,500 kilowatt and will serve the sugar factories in that locality along with local distribution.

The department of distribution is now deep in the task of re-arranging the lines in the different districts to do away with duplication and to standardize to either 10,000 volts or 15,000 volts where both were formerly present. The problem of confining metering within distinct district boundaries is no easy task and is only one of the few problems brought about by the recent consolidation.

Jitney Bonds in Washington

The Republic Casualty Company of Pittsburgh, Pa., has been licensed to write jitney and other surety bonds in the state of Washington. The federal court recently issued a temporary injunction against the operation of these bonds in Seattle without a license.

Judge Neterer of the United States District Court has granted a temporary injunction against 179 jitney drivers of Seattle on the application of the Puget Sound Traction, Light & Power Company. The court held that until the drivers had filed bonds as required by law they had no right to interfere with the rights, franchises, or privileges of the plaintiff. The court further held that such operation of jitneys constitutes a nuisance on the public streets of Seattle and that there can be no doubt that the complainant suffers special damage in loss of revenue on account of these acts, that there is no authority for operating free busses and such conduct is clearly an invasion of the company's rights which the law will not countenance or permit.

New Power Loads

The Swayne Lumber Company, Oroville, has recently been purchased and will be operated on a much larger scale in the future. It is planned to electrify the entire mill to the extent of 300 h.p. This is one of the largest lumber mills in this section of the state.

The Theo Dittel Company has recently installed a large porcelainware plant near Pittsburg, Contra Costa County. This plant will prove a very interesting installation owing to the nature of the finished product and to the process of manufacturing. The initial installation will be 150 h.p.

The Pacific Foundry Company, Eighteenth and Treat streets, San Francisco, has found it necessary to install 100 h.p. additional in motors at its factory, owing to the increased business.

The Pacific Pipe Company, 450 Main street, San Francisco, has installed 50 h.p. additional to take care of the increased business at their pipe works.

The Golden State Baking Company, 1231 Howard street, San Francisco, has made an additional installation of 40 kw. for battery-charging purposes to supply eight electric trucks necessitated by its increased business.

The Alameda Sugar Company has installed an additional 100 h.p. motor-driven plant for the irrigation of sugar beets near Meridian, Sutter County.

Messrs. C. A. Wixon and W. A. Wotherspoon have recently opened up a gravel mining proposition at Mokelumne Hill, Calaveras County, and their initial installation will be in the neighborhood of 30 h.p.

The Lakeside Golf Club, situated near Lake Merced, San Francisco, has just completed one of the most completely equipped and finest golf links in the United States. A total of approximately 100 h.p. has been installed for pumping and other power purposes, as well as for a large amount of lighting.

The Roseville Water Company has announced its intention of installing two 75 h.p. motor-driven pumping plants in order to supply the city of Roseville with water. These plants will be served by the Pacific Gas & Electric Company.

The Diamond Match Company, located at Chico, California, is now engaged in greatly enlarging its plant; several new fireproof buildings have been erected and its electrical equipment is now being installed. The present power capacity is 1600 horsepower, which will ultimately reach a total of 2500 horsepower.

New Engineering Firm in San Francisco

John A. Rice announces that he has established permanent office headquarters at 525 Market Street, San Francisco, where he is at the service of his clients. As consulting mining engineer and geologist, he is prepared to make examinations of mines for investors, to conduct geological investigations, and to undertake the directing of mine development or of operations which require special geological exploration.

A REVIEW OF RECENT BULLETINS

Scientific and Engineering

The Beckman & Linden Engineering Corporation of San Francisco who are the engineering representatives of the Electro Metals Company, have just distributed to engineers interested a three hundred page book setting forth in detail the recent hearing of the Electro Metals Company before the California Railroad Commission in its effort to secure low rates for power from the Pacific Gas & Electric Company, the Great Western Power Co., and the Sierra & San Francisco Power Co.

Of interest to all engaged in a study of reducing household costs are the recent bulletins of the agricultural experiment station of the University of California on growing vegetables under contract, living expenses, jelly stocks, fruit juices and canning of fruit and vegetables.

The determination of nitrogen in substances used in explosives and the ores of copper, lead, gold and silver are treated in technical papers 160 and 143, respectively, just issued by the Bureau of Mines.

The book paper industry is set forth in a letter from the Federal Trade Commission transmitting a preliminary report on the book paper industry to the U. S. Senate. Much of interest to all having to do with the present high price of paper is there to be found.

The Arizona Council of Defense has published a twenty page booklet on its purposes and a brief statement of its work, accomplished and under way.

The Chamber of Commerce of the United States is distributing publicity matter on the present organization of the National Defense Board, its present means for meeting the situation, the work of advisory committees, why central authority is needed and the coal agreement together with other matters of national concern.

A paper on an automatic starter for induction motors presented by H. F. Stratton before the Association of Iron and Steel Electrical Engineers at Chicago is being distributed to the trade by the Electric Controller & Manufacturing Co., of Cleveland, Ohio.

The effusion method of determining gas density is the subject matter of technologic paper 94 just issued by the Bureau of Standards.

The engineering experiment station of the University of Illinois has recently issued circular No. 4 on the economical purchase and use of coal for heating homes with special reference to conditions in Illinois.

Millard's Review of the Far East is a new publication making its appearance at Shanghai, China. Its columns deal with problems of a commercial nature that are now open for solution in China. The publication should prove especially useful to engineers who contemplate—. It is published weekly and sells for twenty cents a copy.

Illumination Advance

Imperial flood light projectors and imperial reflectors are discussed in a thirty-two page booklet just issued by the Crouse-Hinds Company of Syracuse, N. Y.

Crocker-Wheeler motor generator sets for all purposes are described in bulletin 181 now available to the trade.

Review of Utility Magazines That Appear on the Editor's Desk

The Pacific Service Magazine of July appears in its usual attractive mountain scenic covering. The leading article is devoted to the passing of the old Yuba power house and its historic interest. The issue is brim full of new industrial life that is being served by Pacific Service. Three columns on the editorial pages are devoted to a review and

discussion of Mr. C. E. Grunsky's series of articles on rates that is now appearing in the Journal of Electricity and creating such wide spread interest.

The Pacific Telephone Magazine for July is most attractive in its front cover with the red cross nurse silhouetted against a red cross in the back ground. The issue is largely devoted to patriotic matters and devotes especial attention to the splendid patriotism that is being displayed by the telephone employees in the organization of the Signal Reserve Corps service.

The Pacific Power & Light Company's Bulletin for July deals editorially on the food control problem. Its leading article is devoted to a description of the new transmission line to Lind. Many interesting news items are given that display the activity and esprit de corps of this enterprising company.

Edison Current Topics, published by the Southern California Edison Co., is always welcome and inspiring. The issue for July is largely devoted to a description of the new the Pacific Light & Power Corporation into the greater Edison the Pacific Light & Power Corporation in the greater Edison now reorganized and well on its way for the attainment of its high service ideals.

Upbuilding of Electrical Industry

Engineers and others that are interested in the financial condition of the nation as summarized monthly for investors will find much of interest and profit in the four-page pamphlet that is distributed each month by Wm. Morris Imbrie & Co., members of the New York Stock Exchange, 61 Broadway, New York City.

The "Monthly Sales Service" for August published by The Society for Electrical Development, Inc., is not only replete with helpful suggestions but contains an enlarged illustration for window decorative purposes which forcefully sets forth the powerful hand of electricity in upholding the industries and very existence of the nation.

The "Official Bulletin" is the name of a daily that is being published under the order of the President by the committee on Public Information. The bulletin is now seventy-five days old and is proving remarkably efficient in disseminating useful and reliable information regarding the doings of national importance at Washington.

Edison storage batteries for industrial transportation are discussed in a thirty-two page pamphlet just issued from Orange, N. J., the company headquarters. The booklet is well illustrated with technical descriptions of the battery and the applications of the battery in countless industries for driving transportation vehicles.

Viele, Blackwell & Buck of New York City have recently published a handsomely illustrated booklet on hydroelectric and steam plants setting forth the construction work that has been carried on by its offices individually in various parts of the United States, Canada and Mexico. The leading illustrations are devoted to the Great Western Power Company's Feather River development which was designed and constructed by this group of engineers.

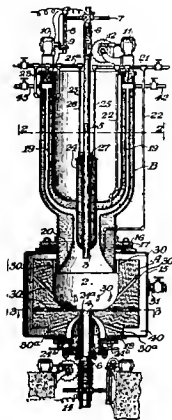
The Commerce Reports, which constitute a daily consular service and are issued by the Bureau of Foreign and Domestic Commerce of the Department of Commerce at Washington are becoming more valuable each day to engineers and commercial organizations throughout the West. These printed reports are for sale by the Superintendent of Documents at Washington, D. C., at \$2.50 per year. To those interested in getting reliable information concerning the engineering and commercial development of our foreign neighbors, they are invaluable.

WHAT WESTERN INVENTORS ARE DOING

(An economic means for the fixing of atmospheric nitrogen in the West is a problem of vast importance. Since an abundance of water power is available and inexhaustible deposits of limestone and other minerals necessary in the manufacture of nitrogen products are available on all sides, the advent of industries of this nature awaits but the hands of the inventor to make a wide application for electro-chemical processes throughout the section of the country. Here is a brief of a recent invention in California on an electric furnace for fixing nitrogen. Briefs on inventions for an automatic signal, an illuminated advertising vehicle-roof, a trolley wheel and an electric furnace are also appended.—The Editor.)

1,232,179. Electric Furnace for Fixing Nitrogen from the Air. Svend Barfoed, Oakland, Cal.

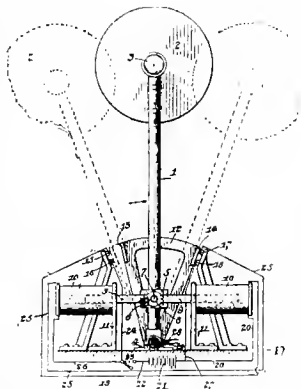
The combination with an electric furnace having a pair of electrodes mounted therein and a source of current supply for maintaining an arc between the electrodes, of means for



delivering air or gas to the furnace and directing it through the sphere of action of the arc and a cooler having an annular cooler discharge passage of large area compared to its volume formed therein directly connected with the furnace to rapidly decrease the temperature of the air or gas after it leaves the electric arc.

1,231,847. Automatic Signal. John M. Carson, Los Angeles.

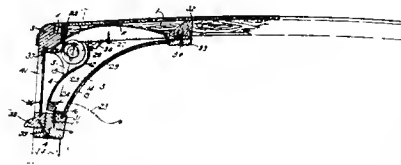
A signal device comprising a swinging arm, a swinging contact member moving about same center as the said arm, circuits including magnets adapted to be energized alternately for drawing the said arm one way or the other, pairs of con-



tacts one of each pair being connected with a source of electrical energy, and one of each pair with one of the magnets, the movable contact member being carried by the said swinging arm against the said pairs of contacts, alternately for bridging those which will complete a circuit through a magnet, first on one side of the arm and then on the other side,

1,232,037. Illuminated Advertising Vehicle Roof. Auguste Jaminet, San Mateo, Cal.

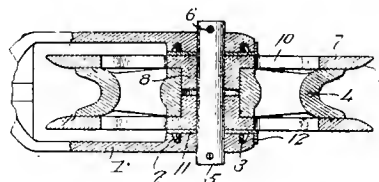
In a vehicle roof construction, a long uninterrupted outside translucent advertising or destination sheet, forming part of the body of a vehicle, a bracket opposite or adjacent to a mediate portion of the sheet supporting a roof of the vehicle above the sheet and supported upon the body frame below



the sheet, suitably located lamps, and a reflector supported by said bracket and concave to said sheet and lamps.

1 231,630. Trolley-Wheel. William O. McKinlay, Westport, Wash.

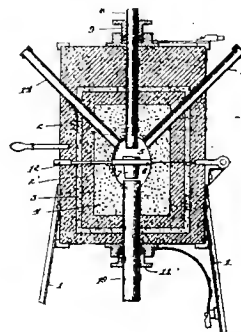
The combination with a trolley harp, of plates rotatably mounted therein, said plates equipped with hubs, a wheel



rotatably mounted upon the hubs, and means for holding the plates in frictional contact with the wheel.

1,232,362. Electric Furnace. Claude G. Miner, Berkeley, Cal.

In an electric furnace, outer and inner spaced walls and heat insulating material in the space between said walls; said furnace formed interiorly of said inner wall with a re-



action chamber having the shape of two opposed paraboloids; and a crucible composed of conducting material in the principal foci of said paraboloids, said crucible constituting a center electrode for two arcs in series.

NEW ELECTRICAL DEVELOPMENTS

(Interest of the past semi-monthly period has largely centered in following the plans of the Southern California Edison Company in its financing of its ten million dollar bond issue, three million of which is to go to the immediate installation of a second unit of the Big Creek development recently acquired by the company in its absorption of the Pacific Light & Power Corporation. It is believed that the strong financial showing of the company and its splendid accomplishments of the past will be of material aid in bringing out the early financial support desired. Other items of electrical development throughout the West follow.—The Editor.)

FINANCIAL

LASSEN, CAL.—The directors of the Baxter Creek Irrigation District have sold the first \$300,000 bond issue of the district and bids for construction work are now being received.

SONORA, CAL.—A special election for a bond issue in Sonora has been set for the near future. The issue calls for \$45,000 to install a municipal lighting system and power station for this city.

SUSANVILLE, CAL.—The sale of \$300,000 of the first issue of the Baxter Creek district irrigation bonds was completed when H. M. McDonald of Los Angeles took the entire issue, paying 97 2-10 and accrued interest. This is one of the highest prices ever paid for irrigation bonds in the State of California, and is remarkable considering that these are the first water bonds offered east of the Sierras.

ALBANY, ORE.—The proposition of voting \$250,000 in bonds for the purpose of purchasing the water system and the light and power plant from the Oregon Power Company, will be put before the people at a special election in December, or at the general election in November of 1918. The Oregon Power Company is now in the hands of the receiver and a public auction will be held on August 13, from the steps of the court house. The estimated cost of a new plant would be \$400,000.

SAN FRANCISCO, CAL.—The statement of earnings of the Coast Counties Gas & Electric Company for the six months ended June 30 shows that the company finished the period with a balance of \$39,079 after bond interest and all other charges. The comparative statement follows:

Six months to June 30—
 Gross earnings, 1917, \$177,501.63; 1916, \$168,733.97.
 Operating expenses, including taxes, 1917, \$88,331.10; 1916, \$81,764.48.
 Net operating income, 1917, \$89,170.53; 1916, \$83,969.49.
 Bond and debenture interest, 1917, \$37,795.34; 1916, \$38,444.40.
 Other interest, 1917, \$1506.10; 1916, \$1873.13.
 Net operating earnings, 1917, \$49,869.09; 1916, \$43,651.96.
 Amortization of debt discount and expense and depreciation, 1917, \$10,789.74; 1916, \$10,779.30.
 Surplus, 1917, \$39,079.35; 1916, \$32,872.66.

LOS ANGELES, CAL.—Plans of the Southern California Edison Company to immediately expend \$3,000,000 on its Big Creek hydroelectric plant and on the transmission line to Los Angeles, have been completed. In addition to the \$3,000,000 for improvement work, the proceeds of the bond sale will be used as far as available, to pay obligations amounting to \$983,287.44 for purchase of stock of Mt. Whitney Power & Electric Corporation, to pay obligations amounting to \$4,000,000 for the purchase of \$5,000,000 of first and refunding bonds of Pacific Light & Power Corporation and to pay in part the outstanding notes of the Edison Company and the Pacific Corporation amounting to \$5,554,891. The bonds are to be issued in series, each series to mature at a date and bear interest at the rate to be determined by the directors of the company. The 1917 series matures July 1, 1919, with interest at 6 per cent. The company states that a syndicate will underwrite the \$10,000,000 issue, so as to net the company 95.62 and to return the syndicate and its managers 3 per cent.

INCORPORATIONS

RENO, NEV.—The Benham Irrigation Company has been incorporated in this city.

NORTHPORT, WASH.—The Northport Light & Power Company has been incorporated here.

OGDEN, UTAH.—The Buckle Electric Company has been incorporated here, by J. V. Buckle, M. M. Allison, Mary E. Peck, Gladys Buckle and J. G. Larson.

TOWER, WASH.—The Farmers Mutual Telephone Company has been incorporated in this place.

RICHLAND, CAL.—The Eagle Telephone Company has been incorporated here with a capital stock of \$1560.

MILES CITY, MONT.—The Deschner Electric Company has been incorporated here by A. J. Deschner and others.

LOS ANGELES, CAL.—The Anderson Electric Car Company of California has been incorporated here by Fred S. Rogers, W. C. Anderson and T. K. Lemmon.

SAN FRANCISCO, CAL.—The California Gas Utilities Company has been incorporated here by W. M. Hunter, C. H. Mathison, M. Waldmeyer, J. A. Phelps and E. R. Ramsey with a capital of \$100,000.

TRANSMISSION

CENTRALIA, WASH.—The president and manager of the Thomas Pulp & Paper Company plans to erect a power plant in Centralia.

SALEM, ORE.—The Salem Electric Company has been awarded the contract for the wiring of the new O. A. C. library in Corvallis.

SAN FRANCISCO, CAL.—The Sierra Electric Construction Company has moved to 619 New Call Building. H. H. Van Luven is manager.

ALBUQUERQUE, N. M.—Plans for the extension of a trolley line from the present terminus at University Heights at least a thousand feet, are being considered.

TWIN BRIDGES, IDAHO.—A high tension electric power line is to be built 14 miles from Twin Bridges to the Bielenburgh-Higgins and the Lake Shore mines, to cost \$26,000.

OAKLAND, CAL.—An ordinance forcing the Great Western Power Company to place its power lines underground within the limits of a zone to be fixed later was urged by Mayor John L. Davie in council.

LOVELOCK, NEV.—The Nevada Valleys Power Company is to extend its lines in Storey and Lyon counties, to connect with the new power plant under construction at Ditho, on the Truckee River.

SAN FRANCISCO, CAL.—Plans have been received by Public Works Officer C. A. Carlson at Mare Island for a one-story frame operating room which is to be erected at the wireless station at San Francisco.

VANCOUVER, WASH.—Bids have been asked for by the state board of control for razing the old administration building at the state school for the blind in this city. In its place will be constructed a brick power plant.

LOS ANGELES, CAL.—The bid of the Southern California Electric Company has been accepted by the board of education for the installation of electrical work in the new Los Angeles High School, on a bid of \$3928.

RENO, NEV.—The Nevada Valleys Power Company, operating a plant at Lahontan and now furnishing power for Lovelock, Rochester, Packard and other districts in Humboldt County, is going to extend its lines into Washoe County.

TUCSON, ARIZ.—The Ajo Implement Company has petitioned the board of supervisors for a franchise to supply the townsite of Ajo and vicinity with water, electric light, telephone, telegraph, gas and sewer service for domestic and commercial use.

PASCO, WASH.—C. S. Knowles, superintendent of construction for the Pacific Power & Light Company, is in this city with an engineer and crew advancing the work of the new central switching station for the 66,000 volt system that will be installed here. It is estimated that the cost will be \$100,000.

LOS ANGELES, CAL.—Chief Electrical Engineer Scatergood plans to install an auxiliary power plant in San Francisco Canyon, to be ready for service within a few months. The public service commission has awarded to the Westinghouse Electric Company, the contract for the generator, transformer and equipment for this plant, the price being \$31,735.

GOLDFIELD, NEV.—A high tension power line will be built from Verdi to the Poveille mining districts on Peavine mountain a distance of four miles, by the Truckee River General Electric Company. The line will be put in to supply power to the mines operating in that district and surveys will be started at once. It is expected that other companies operating in that district will take advantage of the power line and will install electric plants.

MODESTO, CAL.—Settlement of litigation over certain water rights on the Tuolumne River between the Modesto and Turlock irrigation district and the Yosemite Power Company, which has covered a period of 10 or 12 years, has been made and the power company has been awarded 66 second feet of water of the Tuolumne River. This will be measured at the La Grange dam, near where the company has a power plant and mining interests. The Yosemite Power Company is an outshoot of the Mt. Whitney Power Company, owned by John Hays Hammond interests.

LOS ANGELES, CAL.—An amendment to the city ordinance regulating electric wiring in buildings exempting dwellings of one room or less from the provision requiring the placing of wires in rigid metal conduits, has been recommended to council by the committee on public safety. Many protests have been made by the owners of small dwellings against being compelled to install wires in rigid metal conduits because of the great expense as compared with the knob and tube system, which the public safety committee regards as sufficiently safe for small houses.

TRANSPORTATION

SEATTLE, WASH.—An extension of the municipal street car system that will cost close to \$500,000, has been authorized by the city council.

SAN FRANCISCO, CAL.—The City and County of San Francisco by Eaton & Smith has awarded the contract to H. S. Tittle, contractor, for supplying trolley poles and electric work for the Twin Peaks tunnel for \$10,179.

TACOMA, WASH.—An ordinance was introduced in the city council recently to purchase a machine to convert alternating to direct current for the use of the municipal street car line. The machine will cost \$22,000 and will transform 4000 volts of alternating current into 600 of direct.

RICHMOND, CAL.—Although the Southern Pacific Company's franchise for an electric railway along Cutting boulevard to Tenth street and north on that thoroughfare to its main line tracks expired last year, the company, according to City Attorney D. J. Hall, is preparing to go ahead with this work shortly.

ILLUMINATION

LOS ANGELES, CAL.—A new ornamental lighting system is planned by this city.

SAN LUIS OBISPO, CAL.—The city council of San Luis Obispo is receiving sealed bids for furnishing gas or electricity for lighting the streets and public buildings of this city.

SAN DIEGO, CAL.—A petition applying for the formation of a public highway lighting district of the Normal Heights district has been filed with the clerk of the board of supervisors.

HALFWAY, ORE.—The city council has granted to the Idaho Power Company, a franchise until April 1, 1917, to operate in the town of Halfway, Baker County, Ore., electric light and power lines.

LOS ANGELES, CAL.—A petition has been filed with the board of supervisors asking for the establishment of a highway lighting district, to be known as the Stephenson Avenue and Laguna Lighting District of Los Angeles County.

LIVINGSTON, CAL.—The Livingston board of trade is now circulating a petition asking the supervisors to call a special election to vote on the proposition of the formation of a lighting district, to take in all of the two town sites.

HANFORD, CAL.—A new system of electric lighting will probably be adopted by the city shortly, electroliers being substituted for arc lights in the business section, while new lights will be installed throughout the residential portion of the city.

VENTURA, CAL.—Not only will Main street from Figueroa to Chestnut be equipped with ornamental lights, but California from Poli to Santa Clara Street will likewise be lighted, according to a motion passed at a meeting of the board of trustees.

REDWOOD CITY, CAL.—The Pacific Gas & Electric Company has submitted a bid offering to furnish 15-100 refractor style unit candle power lamps for Visitacion Valley lighting district for \$2.15 for each lamp per month. The bid was accepted.

RICHMOND, CAL.—The most important rate investigation here since that recently held over rates of the East Bay Water Company, promises to be the one now started by Richmond into the charges made for gas service in the city by the Pacific Gas & Electric Company.

SAN FRANCISCO, CAL.—The Point Lobos Improvement Club has appointed a committee to confer with Mayor Rolph, the board of supervisors and local lighting companies in an effort to obtain a more extended and uniform street lighting system for the Richmond District and Golden Gate Park.

AUBURN, CAL.—The Pacific Gas & Electric Company has secured an injunction against the board of supervisors, sitting as a board of equalization, prohibiting the board from raising the assessment of the company's non-operative property in Placer County. The increase sought to be made was \$58,430.

SANTA CRUZ, CAL.—A forest fire, which some weeks ago swept timber lands in this vicinity, leaped from smoldering embers into flame again last week. With renewed vigor it burned on a seven-mile front, destroying, it is reported, the plant of the Coast Counties Gas & Electric Company at Mill and Big creeks, a number of houses and valuable timber.

PENDLETON, ORE.—A new lighting system for Pendleton and the removal of electric poles and wires from Main street are improvements being contemplated by the Pacific Power & Light Company, according to the local manager. The plan would cost the city about \$800 more a year and would cost the company \$7000 or \$8000 more annually.

EL CENTRO, CAL.—A special session of the city council will be held to consider a report of a committee delegated to investigate the condition of the conduit system employed in lighting of the Stone Pacific Addition on the North Side. A delegation from this addition petition the council to take over the lighting system, but before taking definite action on the matter an investigation of the system was to be made.

MOJAVE, CAL.—At a representative meeting of the business men the street lighting proposition for the town was given a good start. The meeting was held under the direction of the board of trade, and F. S. Smith of the Edison Company gave considerable detail as to style of lights and cost. The lamps proposed to be used are the tungsten incandescent. The matter of circulating a petition for an election for a lighting district was taken up and Constable Hamilton volunteered to get signatures. A plan of this district has been made by the secretary. This must be sent in with the petition to the board of supervisors.

TELEPHONE AND TELEGRAPH

SAUSALITO, CAL.—The board of trustees have sold a telephone franchise to the Pacific Telephone and Telegraph Company.

INDEPENDENCE, CAL.—A motion was carried at the Obispo is receiving sealed bids for furnishing gas or electric. Frank Pellisher and E. S. Moore for a franchise to maintain a telephone line in certain portions of Inyo County be accepted.

ENTERPRISE, ORE.—An ordinance has been passed by the city council granting the Home Independent Telephone Company the right to operate in the city of Enterprise, Ore. The franchise shall be in force for a period of 10 years from the date.

SUNNYSIDE, WASH.—The city telephone company is asking for a franchise to operate in the city with terms similar to the old ones which the two companies held. The City Telephone Company wants to construct under ground cables instead of the overhead lines that are now in use.

SAN FRANCISCO, CAL.—The California Telephone & Light Company earned its interest more than two times during the twelve months ended May 31, 1917, according to the earnings statement received by the National City Company. The comparative statement follows: Twelve months ended May 31, 1917, gross revenue \$135,532.47, 1916; \$126,323.96. Operating expenses, maintenances and taxes, 1917, \$78,552.29; 1916, \$77,450.71. Net incomes, 1917, \$56,980.18; 1916, \$48,873.25. Interest charges, 1917, \$27,908.18; 1916, \$26,018.42. Balance 1917, \$29,071.69; 1916, \$22,854.83.

IRRIGATION

SANTA BARBARA, CAL.—On the Jacobson ranch a complete water system, piped to every part of the land has been installed and it is the plan of the owner to continue this water system over the adjoining places.

ALPAUGH, CAL.—Work has been completed on sufficient of the laterals of the Tulare Lake Water Company's system for the irrigation of 30,000 acres of land in the lake bottom, now either in the non-productive class or devoted to dry farming.

MODESTO, CAL.—The directors of the Modesto irrigation district have also decided to press the suit brought against the City of San Francisco to determine the water rights of the districts and of the city on the Tuolumne River, which were filed several years ago.

LODI, CAL.—The petitions for the organization of the Woodbridge irrigation district have been placed in the hands of the abstract company for the purpose of checking the signatures and mapping out the territory in the proposed district. The petition has about a hundred signatures.

WILLOWS, CAL.—A 150 ft. well is being drilled on the

Christianson & Burmeister ranch five miles southeast of here, and twelve or thirteen others are to be installed in the near future. They are to be used for irrigating rice, and will supplement or replace water now taken from the West Side Canal Company's ditch.

WOODLAND, CAL., Plans not yet finally settled upon call for the irrigation of 12,000 acres of land in the northern part of the county, that is now devoted to dry farming only. It is proposed, if the tests show the scheme feasible, to install several pumping plants. The electric company, too, will be asked to install power.

WILLOWS, CAL.—That work will begin soon on the Cross irrigation project, known as the Central Jacinto irrigation project, is evidenced by the application made a couple of days ago to the state reclamation board for approval of the district's plan to install an intake in the Sacramento River. And although the date for the hearing has not yet been set, it is believed that it is not far off.

LODI, CAL.—The first papers of of the newly organized Wright irrigation district have been filed with the county clerk. The district is said to be composed of 19,010 acres of land belonging to 147 owners. The district is to take over the reservoir, dam and ditches formerly owned by the Stockton-Mokelumne Canal Company.

PALO CEDRO, CAL.—What may be called a home-made irrigation district has started off with furnishing an abundance of water for the irrigation of some 2000 acres in this neighborhood. Farmers early last fall formed the Big Cow Creek Ditch Company and commenced the construction of an irrigation system having eight miles of canal. Between 1000 and 1500 inches of water are turned on the land at a cost of only \$5 an acre.

WILLOWS, CAL.—A contract is to be given in the very near future and possibly next week for the building of a big private irrigation system on the P. B. Cross property lying between here and the river. The 9000 acres belonging to Cross are to be irrigated for growing rice and will require the building of about 10 miles of main ditch and a complete system of laterals. It is estimated that the work will require five months for completion.

FRESNO, CAL.—Land owners of Madera County in the vicinity will meet Saturday in the county seat of that county for the purpose of considering the formation of an irrigation district to irrigate from 300,000 to 400,000 acres. A reservoir to store the waters of the San Joaquin, Fresno and Chowchilla Rivers would cost in the neighborhood of \$10,000,000, according to report of Louis C. Hill, Los Angeles engineer, who has also reported on the Pine Flat project in this county.

WASHINGTON, D. C.—Secretary Lane has announced conclusion of a contract with the Imperial Laguna Canal Company of Southern California, whereby a tract of between 120,000 to 200,000 acres of arid land adjoining the Imperial Valley is to be irrigated by an all-American canal thirty miles long. The water is to be taken from the Laguna dam of the Yuma reclamation project at Yuma, Arizona. A joint survey and examination of the canal route first will be made by the representatives of the government, the company and the State of California.

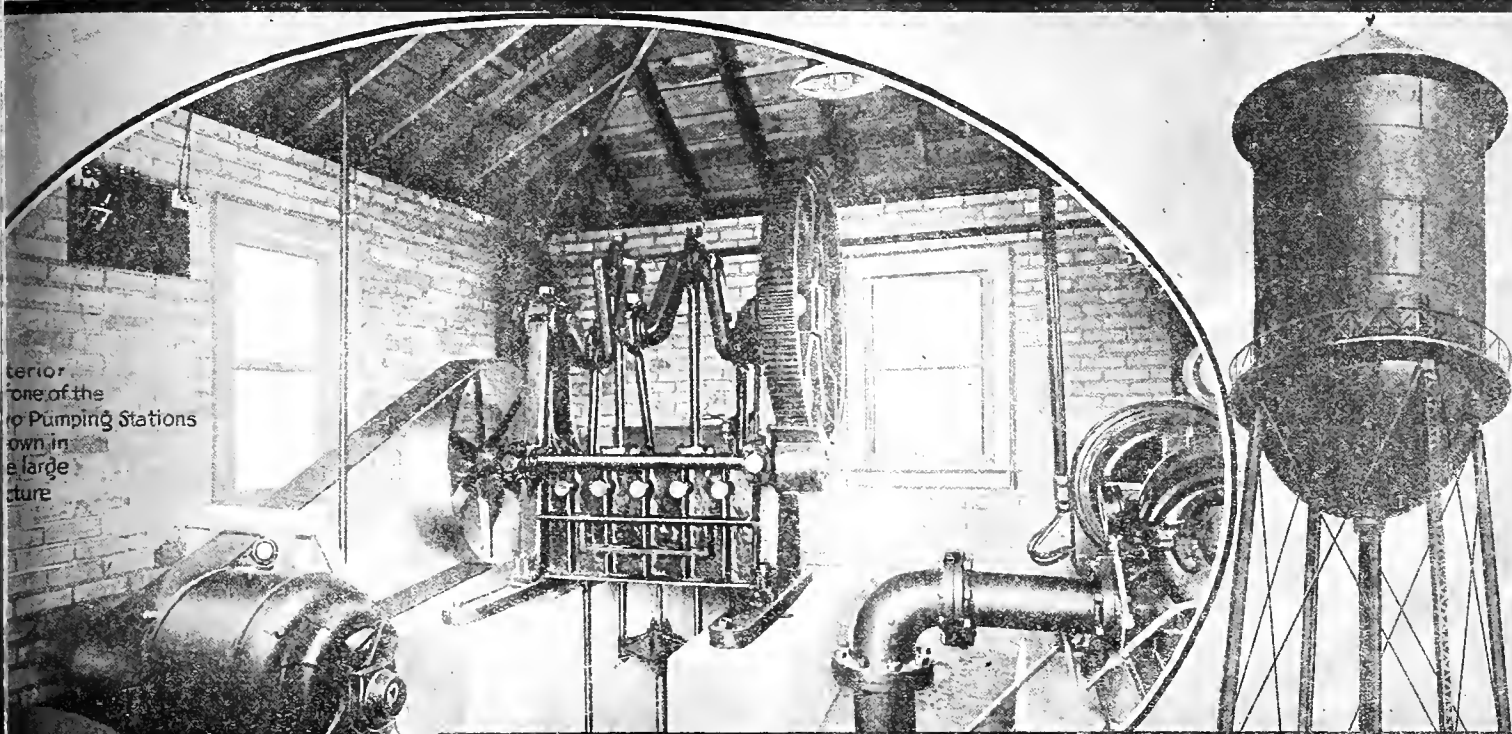
SUSANVILLE, CAL.—Engineer C. E. Grunsky and other officials of the Long Valley irrigation district made a trip to the Little Truckee River for the purpose of preparing for the survey of their 24-mile ditch to convey the waters of that stream to their project. The district has made application for permission to take 32,000 acre-feet of water from the Little Truckee. Survey of the canal will be commenced at once for the purpose of completing the details required in their report to the State Water Commission. The district has a natural storage basin at the Scott ranch in Long Valley which will impound 95,000 acres-feet of water. At the present time there is embraced in the boundaries of the district 28,000 acres of land.

JOURNAL OF ELECTRICITY

VOL. XXXIX NO. 5 SAN FRANCISCO, SEPTEMBER 1, 1917 PER COPY, 25 CENTS

In This Issue —

Everything that is good and wholesome for the upbuilding of the electrical industry in the West and in the countries bordering the Great Pacific



terior
one of the
Pumping Stations
own in
a large
ature

SELECTED AS THE MOST SUITABLE AND PROVEN THE BEST POSSIBLE SELECTION

Note the remarks of the contractor to the pump manufacturer concerning this installation of Wagner Motors for the City of Zeeland, Mich.

"As you know, the pumps are controlled electrically, so there is no operator in charge. The electrical apparatus starts and stops the motors to drive the pumps as the demand for water is made. I feel that since this equipment has been in operation -- nearly a year -- a letter to you, in regard to the satisfactory manner in which the pumps have worked, would be in line. We have had several letters from the young man in charge of the station, and in every letter his report has been the same -- that the machinery was in every respect as we had left it, and operating satisfactorily."

These are Wagner BW (Self-starting) Type, Polyphase Motors. The starter is on the inside and automatic. Ideal for remote and automatic control. When started by hand a single-throw switch is all the starting device necessary. If you have need for power service of this kind, investigate Wagner, Quality BW Motors. Send for Bulletin No. 111 and Booklet, "A Motor for Every Pump."

Wagner Electric Manufacturing Company, Saint Louis, Missouri



Water Plant installed for city of Zeeland, Mich.



S MALL shop layouts usually call for several machines requiring less than one horsepower each.

On paper the layout can apparently be most quickly made by selecting one motor to drive all the machines, but the proposition is still on paper, as delivery on necessary belts, pulleys and hangers may prove limiting feature.

Under present manufacturing conditions, the quickest operative layout is assured by putting a motor on each machine.

We Can Ship From Stock

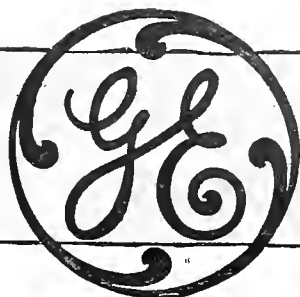
Form C Single Phase **Motors**

in sizes $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ h.p., 1800 r.p.m.

The installation will be completed quickly, and the shop will be operated more economically since each operative machine becomes an independent unit.

Ask our nearest offices about prompt shipments on small R I Motors

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Pacific Coast Sales Offices in San Francisco, Los Angeles, Portland, Seattle and Spokane; Rocky Mountain Sales Offices in Denver, Colorado; Salt Lake City, Utah



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VOLUME XXXIX

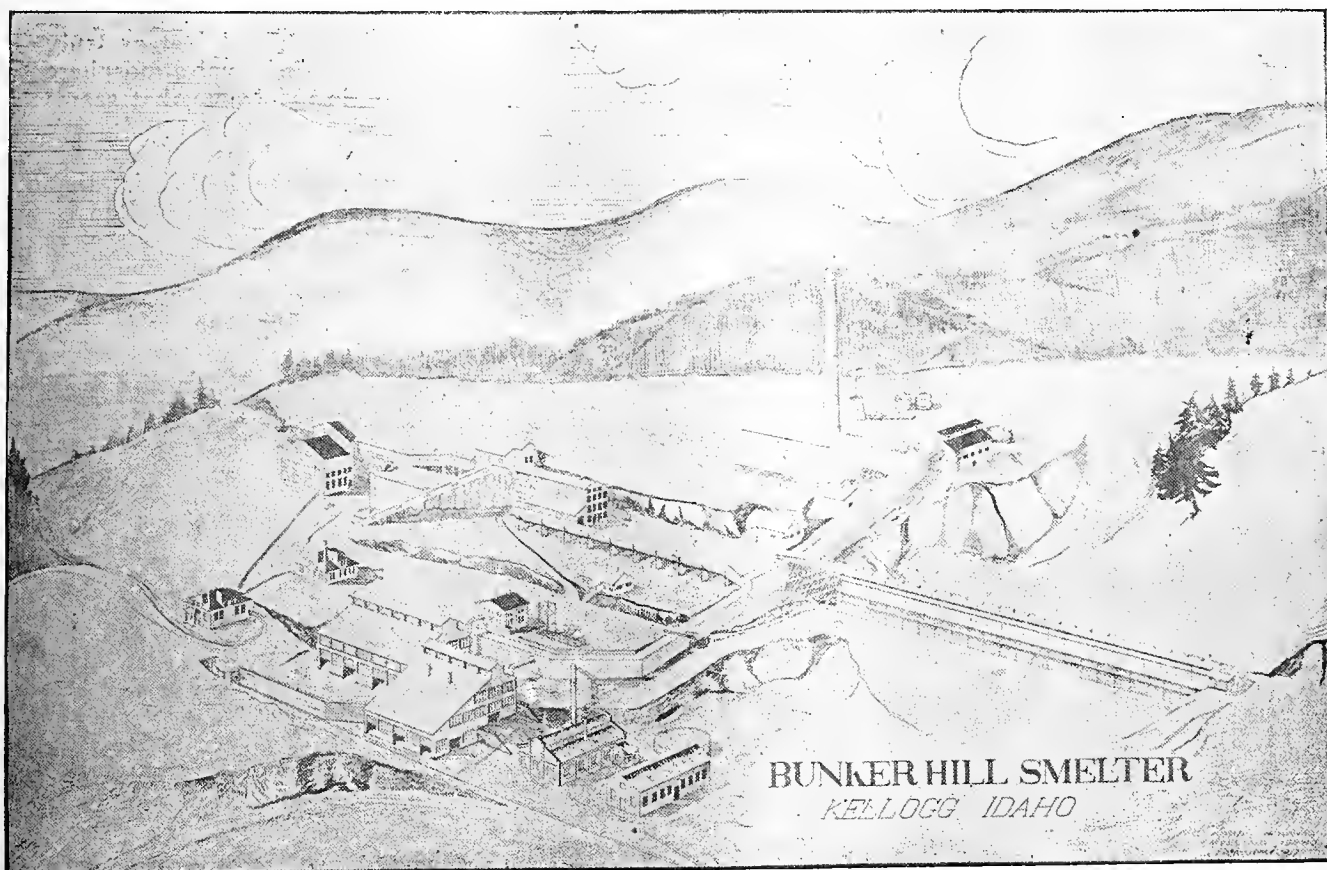
SAN FRANCISCO, SEPTEMBER 1, 1917

NUMBER 5

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NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION

(Spokane is the Mecca towards which all eyes of the electrical industry in the West turn during the month of September. Blessed with unlimited water power resources, rich in mineral wealth and in fertility of the soil, the great Inland Empire stands ready to welcome the guests of the Northwest Electric Light and Power Association, September 12-15, 1917. Not only are leaders of the industry at Spokane, Seattle and Portland busily engaged in preparation for a successful gathering, but down in the states to the south, especially in California, is great interest being manifested in the successful outcome of the convention. A special car containing men prominent in the industry leaves San Francisco for Spokane via Seattle on the Shasta Limited September 9, 1917.—The Editor.)



THE SMELTER FOR THE GREATEST LEAD-SILVER MINE IN THE WORLD—THE BUNKER HILL & SULLIVAN

In addition to the presentation of a series of papers of unusual helpfulness as listed in the Journal of Electricity for June 1, 1917, those having the convention of the Northwest Electric Light & Power Association in charge have made arrangements for a visit by all guests of the convention to the electrically operated Bunker Hill & Sullivan mine at Kellogg, Idaho. This is the greatest lead-silver mine in the world and is a marvel in its application of the method electrical to the mining, milling and smelting of precious ores. The Journal of Electricity will publish its next issue as a special convention number, featuring the papers to be presented at this convention and dwelling upon the wonders of electrical application at the Bunker Hill & Sullivan. In addition, there is to be published at Spokane during the convention, one of the service issues of the Journal of Electricity, setting forth the happenings and attendance at this remarkable gathering.

THE CONVENTION HEAD-QUARTERS

The Davenport Hotel in which the convention of the Northwest Electric Light & Power Association will be held on Sept. 12-15, 1917, has adopted for its slogan an expression very frequently applied to it by those best able to judge of its merits, namely, "One of America's Exceptional Hotels."

Structurally, it represents the last word in safety. Constructed of steel, stone and terra cotta it is in every respect a Class A building, which is to say that it is absolutely fireproof; a factor of prime importance to the traveling public.

The remarkable lobby of the hotel, of which a partial view is here shown, is a wonder place to the student of architectural and decorative art, and just as truly reflects that informal atmosphere and inviting welcome that seems to permeate every part and every feature of the house. The style followed in the lobby is that known as the Spanish Renaissance. The significance of the ornamentation adds much interest to the pronounced beauty of the delicate coloring in the lobby.



Convention Headquarters—Hotel Davenport, Spokane



THE INTERIOR OF THE DAVENPORT

Luxurious and inviting, this hotel will prove itself a place in full keeping with the dignity and hospitality of the industry for which it will be the host.



The Spokane Falls in the Heart of a Great Business District

THE GIANT POWERS OF THE INLAND EMPIRE

Spokane, the convention city for the Tenth Annual Convention of the Northwest Electric Light & Power Association, is the commercial and geographic center of the great Inland Empire.

The conspicuous feature of interest to guests and delegates to the forthcoming convention of the Northwest Electric Light & Power Association is the vast water power resources encompassed in this part of the country. The principal development, thus far, is on Spokane River, where 172,000 h.p. is utilized; other power developed and in use is on the Okanogan, Yakima, Similkameen and Clark's Fork.

The power possibilities of the numerous streams referred to are shown in more detail in the following estimates:

Spokane River—	
Week's site, near Trent bridge.....	8,000
The Narrows, 1½ miles above mouth.....	13,000
Smelter site, 2 miles northwest of Spokane.....	5,500
Estimated possible addition	75,000
Priest River—	
Near mouth (Panhandle Electric).....	13,000
Seven miles above mouth (Panhandle Electric).....	7,000
Pend Oreille River—	
Metalline Falls, two miles below falls.....	10,000
"Z" canyon	80,000
International Electric Co., sites, across B. C. line..	80,000
Salmon River—	
Whitebird, Wolbert and Oxbow sites.....	100,000
Columbia River—	
Priest Rapids	500,000
Kettle Falls	80,000
Chelan River mouth	75,000
Umatilla Rapids	120,000
Snake River—	
Palouse Rapids	50,000
Asotin Site	55,000
Coon Hollow	200,000
Cherry Creek	200,000
Mountain Sheep	120,000
Salmon River tunnel	200,000
Additional to Mountain Sheep.....	80,000
Total	2,371,500

The Washington Water Power Company's modern equipment and large production of electric power on Spokane River have kept pace with a rapidly increasing demand for light and power service within a 200-mile radius. The cement plants, mines, concentrating mills, paper mill, shops, factories, saw-mills and interurban railroads are all served with electric current from central station plants. As industries expand the use of this power will increase; and the demonstrated adaptability of electric power, the practicability of long-distance transmission, and the assurance of an ever-increasing supply, constitute factors which create demands,



RAINBOW FALLS, HEAD OF LAKE CHELAN, WASHINGTON

The district surrounding Spokane presents every feature of pleasing possibility for future power development. From high head and small flow on its mountain tributaries to low head and giant flow of the Columbia, this region has a potential possibility of over two million horsepower in future electrical development.



The Bonding Gang at Work

THE WHITESON-CORVALLIS ELECTRIFICATION

BY PAUL LEBENBAUM

(The electrification of the lines of the Southern Pacific Company, in so far as this work has been accomplished, has proven to be a model of efficient constructive effort. Here is a description of interesting features of the recently completed electrified unit of the Southern Pacific Company out to the south of Portland known as the Whiteson-Corvallis electrification. The author is the electrical engineer that had charge of this work for the Southern Pacific Company.—The Editor.)



Line Construction on Curve

ON June 17, 1917, the Southern Pacific Company placed in operation an addition of 42.3 route miles (47.5 miles of single track) to the 1500 volt d.c. electrification of its Portland (Oregon) Division. As shown on the accompanying map, the first electrification, placed in operation in January, 1914, was of the West Side Branch, from Portland through Forest Grove to Whiteson; the Newberg Branch, from Portland through Newberg to St. Joseph, and of the Tigard Branch, from Beaverton to Cook, a total of 120.0 miles of

single track. The new electrification runs almost due south from Whiteson to Corvallis, the distance from Portland to Corvallis via Newberg being 87.8 miles.

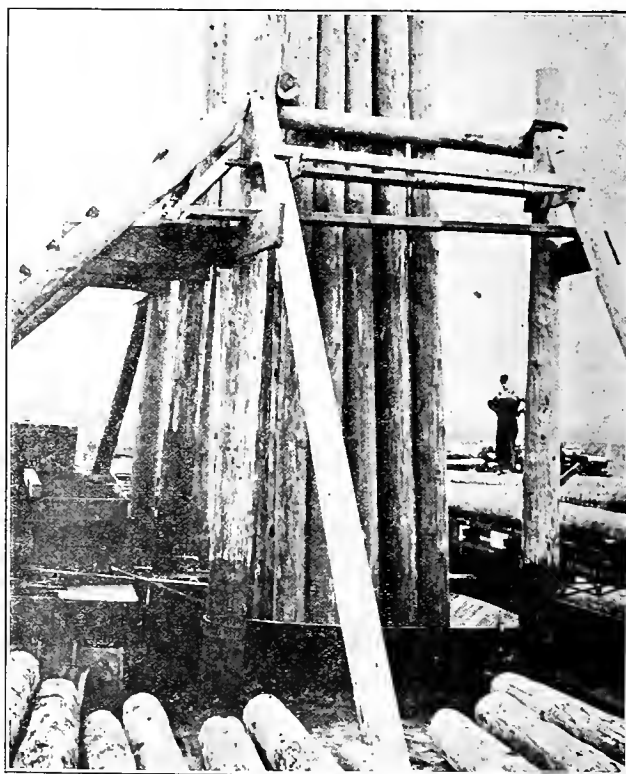
In general, the new line construction, as shown in the accompanying photographs, follows the same catenary standards as used in the earlier work, modifications and refinements in details being made only as result of operating experience.

In distributing material, loading, unloading and setting poles, stringing messenger, trolley and feeders, the fullest possible use was made of a work train and locomotive crane. All poles were given an open tank butt treatment with creosote at a temperature of 220 deg. F. at a plant erected especially for this purpose; the total number of poles treated was 2300. Poles were framed in the ground, all material assembled complete, and then set in the hole by the crane. Poles for transmission line and catenary are 50 ft. long; for catenary only, 40 ft. long; the standard spacing is 150 ft.

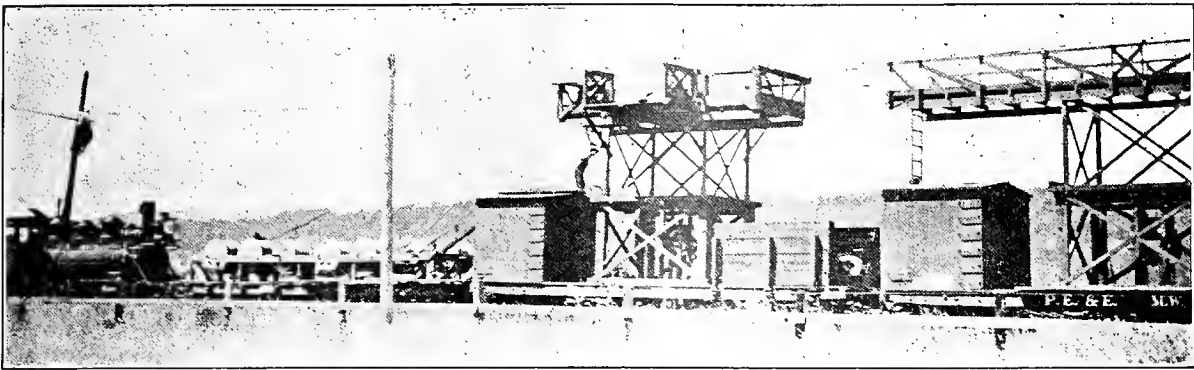
Two feeders, each of 636,000 c.m. aluminum, are used over the greater part of the new line.

The messenger is 7/16 in. 15,000 lb. steel strand and the trolley wire is standard No. 4/0 grooved, suspended from the messenger at 15 ft. intervals. In erecting, one entire span was clipped up at a time, four tower cars being coupled together. The average time to clip a span was one and one-half minutes, including move of the work train.

Substations were erected at McCoy and Wellsdale, to convert from 55,000 v., 3 phase, 60 cycles, to 1600 volts d.c. by means of synchronous converters. Each substation contains one 1000 kw. unit, consisting of two 500 kw. 787.5 volt machines in series on the d.c.



Treating Plant, showing Poles in Tanks



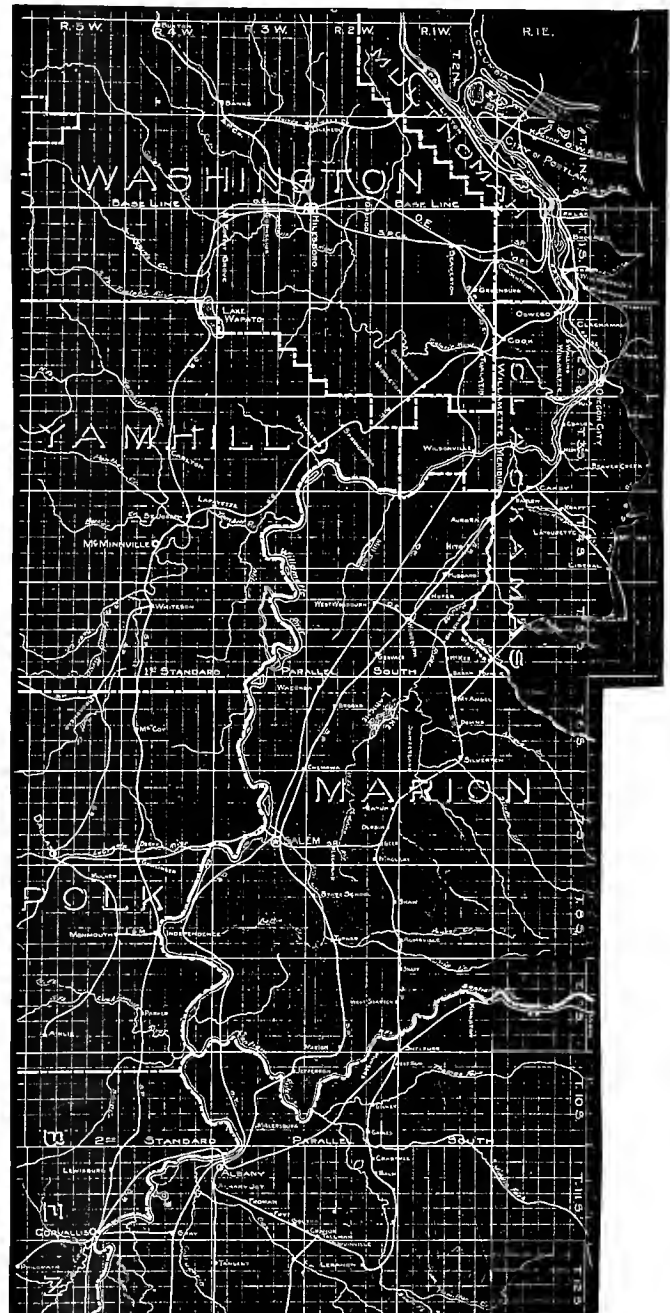
Stringing Messenger and Trolley Lines

side; the alternating current supply is stepped down from 55,000 volts through a three phase water cooled outdoor type transformer to 580 volts, the secondaries being connected double-delta, and the primaries, star. Outdoor type 55,000 volt lightning arresters are used.

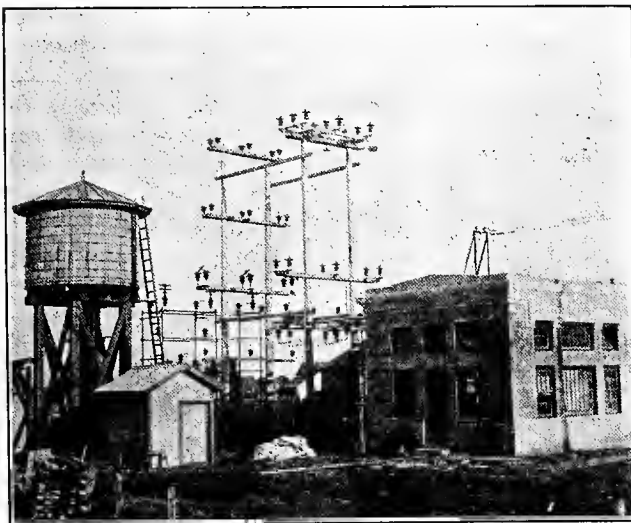
The converters and transformers were furnished by the Westinghouse Electric & Manufacturing Company and the switchboards and lightning arresters by the General Electric Company. In addition, each substation contains a motor driven air-compressor and a motor driven triplex pump for water supply.

Energy is purchased at Salem, and a transmission line, 10.7 miles long, was built along the railroad right of way to Gerlinger, thence north and south on the poles supporting the overhead construction to the two substations, the total length of 55,000 volt line being 34.4 miles. The insulators are Locke No. 341, mounted on Peirce forged steel pins and Peirce cross arm saddles.

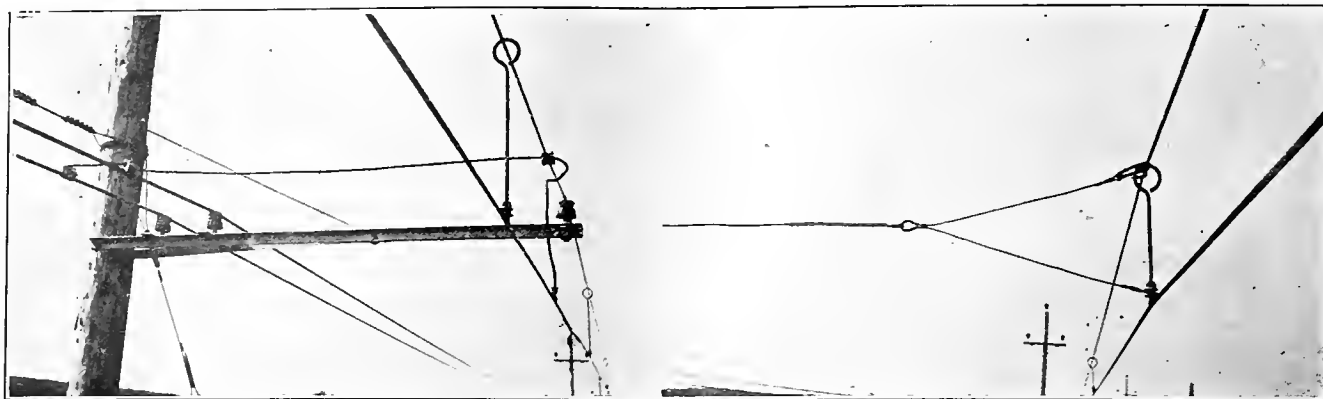
The bonding was done with concealed pin expanded, 0000 type of bond of the ribbon or cable type, depending upon the type of rail installed. The bond used is the American Steel & Wire Company's. Cross bonds are placed every 1000 ft. and are constructed of



Map showing the new Electrification South from Portland to Corvallis



The McCoy Substation



Feeder Tap from 2-636,000 c.m. Aluminum Feeders

The Curve Pull-off for Trolley Wire

1 in. square iron rods connected at each end to the rail by short copper jumpers. These iron rods are used in order that thieves will not steal them.

EASTERN RATES FOR ELECTRO-CHEMICAL INDUSTRIES

In a recent hearing before the California Railroad Commission the following interesting testimony was brought out relative to eastern rates for electro-chemical industries with explanation of terms used.

The kilowatt-hour is a unit of measurement used to sum or integrate fluctuating demands for power as ordinarily used in house lighting or motor loads in small plants. That is, the kw.-hr is a small unit adapted to the measurement of small irregular power loads and since such a system of measurement is a summation or integration of constantly varying quantities it cannot allow for the load power factors of the loads which make up the total load of a power producer. Hence, the power producer has to have power available which is not taken by the consumer and is not paid for on the kw.-hr. basis of measurement.

On the other hand an electro-metallurgical load presents a practically continuous demand with very small fluctuations. The consumer is made responsible for his load factor and power factor by the simple process of the producer selling to the consumer a block of power at a certain rate per h.p. yr., of peak demand. In this way the producer does not worry about the load factor of that portion of his load.

The electro-metallurgical load is very desirable as is shown by the practice of Eastern power companies in giving special rates to such consumers of power who are able to use certain quantities of off peak power. As this extra power fluctuates it is sold by the kw.-hr. in distinction to the ordinary non-fluctuating load sold by the h.p.-yr.

Prices for Power for Furnace Plants at Niagara

(These prices are for open top furnaces)

1914 Ontario Power Company.

Day peaks used in determining monthly demand were taken from 2:30 p. m. to 6:30 p. m.

Peak power at \$12.75 h.p. year, or .00195/kw.-hr.

Extra power at .00132/kw.-hr.

1916-17 Toronto Power Company.

Day peaks used as basis for determining demand.

Extra power 10 p. m. to 6:30 a. m.

Peak power \$20.00 h.p.-yr. or .0032/kw.-hr.

Extra power \$.002/kw.-hr. or approximately \$12 h.p.-yr.

Power factor on similar furnace load 90-95 on T. P. Co. lines.
Load factor = 90 to 97% on maximum daily minute peaks on the Toronto Power Co. load.

THE EXTENSION OF ELECTRICAL SYSTEMS IN ENGLAND

Much attention is being given to the investigations and recommendations of the committee appointed by the board of trade to report upon the possibilities of extending and interconnecting various sources of supply and providing economical and convenient electric power for British industries. The full report of the committee is not yet available, but a great deal of discussion upon the subject has recently appeared in the English press. It is suggested that a national railway, road, telegraph, and telephone systems, and stress is laid upon the advisability of insuring that there shall be an adequate and economical supply of power for all classes of consumers in the United Kingdom, particularly industries that depend upon a cheap supply of power for their development. The intercommunication of existing municipal electrical plants and the establishment of central generating stations are among the questions now being given practical attention.

A preliminary statement recently made by the committee of investigation embodies the following conclusions, as reported by the Yorkshire Post:

1. That when British industry is subjected to the test of keen international competition after the war, its success will depend upon the adoption of the most efficient methods and machinery, so as to reduce manufacturing costs as much as possible.

2. That a highly important element in reducing costs will be the general extension of the use of electric power supplied at the lowest possible price, and it is by largely increasing the power used in industry that the average output per head, and as a consequence the wages of the worker can be raised.

3. That the present system under which a supply of electricity is provided in a large number of small areas by separate authorities is the result of a policy adopted at a time when the applied science of electrical engineering was in its infancy, and is incompatible with anything that can now be accepted as a technically sound system.

4. That the interconnection of existing supply stations recommended by the board of trade in their letter of May 25, 1916, however desirable in itself, cannot alone meet the requirements of the situation.

5. That a comprehensive system for the generation of electricity, and where necessary reorganizing its supply should be established as soon as possible.

RETAILING AND MERCHANDISING

BY W. H. GRIBBLE

(Here is how a well-known electrical contractor and dealer in Central California has succeeded in establishing a very successful business by paying careful attention to new industrial business, by consistently advertising the advantages of the purchase of electrical goods and appliances from an electrical dealer in addition to establishing an harmonious and efficient organization for conducting his business. This was all accomplished in spite of the fact that there are in his neighborhood a number of hardware stores, a tea-store and a central station, all selling electrical appliances. This paper was read before the recent Santa Cruz Convention of the California Association of Contractors and Dealers. —The Editor.)

"Introduction and education" being the watchword let us now proceed to interview the man who is to do this service—the electrical dealer or contractor-dealer. What kind of an individual do we find him? Does he know electricity and his wares? Is he acquainted with and does he appreciate the exactions demanded of him by his business and his customers? Does he know what it costs him to serve the public and is he protecting himself against this crafty leak commonly known as "Overhead?" Has he malice in his heart for his neighboring competitor? What does he know about salesmanship direct or through the advertising columns of a newspaper? Can he prepare copy for an ad that will put it across? Can he figure turn-overs or is this a question mark to him? All these and more too, must the real electrical merchant be and know today if he is to succeed.

We find him generally speaking, a man well up in the technical understanding of his commodity. In this he has a great handicap over his brother competitor in the department, hardware and other lines which attempt to sell service in the electrical retail game. However, if he is to hold his own with the aforesaid competitors he must study their ways and methods of merchandising and profit accordingly. He should and must when opening a store make up his mind once and for all to give service—honest, faithful, truthful service or prepare ultimately to be added to the list of "also rans."

Now let us look at his preliminaries to opening a store. Too often is it the case I am afraid, when he finds himself with a few hundred dollars to the good, the idea possesses him of becoming a merchant—he proceeds to look for a store,—maybe meets a representative of one of the other lines of the industry who gladly, perhaps eagerly helps him find a store; seeing a possible chance to ultimately sell some goods and get another account on the books. You notice I say selects a store. It should be selects a business location—a location that takes advantage of traffic, trade, transportation and public attraction features in the city, or section of the city where the proposed store is to be located. How often is the reverse the case. We see a store opened, the owner hangs out his sign "Electrical Contractor and Dealer" and from its location and appearance the contracting feature apparently is the uppermost in his mind. I recall at the moment a

"Electricity with its application to the everyday uses of the housewife, is yet in its introductory stage. The housewife must be educated to its applications and made acquainted with the many appliances for her use, on the market. She must be brought to the appreciation of the opportunities waiting to give her relief from drudgery. In this the 'male of the species' should not be overlooked either."

store that has recently been opened. It is at least ten minutes from the business part of its town; the neighborhood is fairly built up with private houses probably all owned by the occupants and fully equipped for electricity. Directly opposite the store, which stands on a corner, is a church, the only opportunity

of getting any business from which would possibly be on Sunday—the day our electrical merchant is closed up. The other corners are vacant lots. There being no other stores handling lines appealing to women in the vicinity, naturally a woman in this district desiring to shop

takes the car or her machine and goes closer to the shopping district giving our electrical man the "go by."

Right here I say the selection of this location was bad business judgment from the retail end of the man's business and if he was solely responsible for its selection great care should be exercised by credit men of concerns he may have business dealings with. If he selected it after consultation with representatives of other branches of the industry, his jobbers, for instance, then it is plainly evident I believe, that other careless handling, snap judgment, or the desire to sell a bill of goods influenced action. Again I want to say, I believe we as an association should be in a position and ready to advise with a man contemplating business entrance, as to at least some of the problems he should first decide before putting out his sign and try to keep him off the road to bankruptcy. In this work the jobbers and central stations also could be of invaluable assistance, if as indicated above the final location of the store is decided strictly on merit and not with the desire primarily to add another customer to the books. The would-be merchant should be given a fair idea as to what capital is required to operate a respectable, presentable retail store in the town in which he proposes to locate. He should be examined on his knowledge of the cost of conducting a retail business; his knowledge of bookkeeping, cost accounting and business methods. His knowledge of advertising, soliciting and selling and if found wanting should be taken in hand and educated to a proper understanding of these essentials of business. Until he has proven himself, then and not until then, I hold is he a proper risk for any credit man's department.

Not only does this apply to the man about to enter business but those already in business should

be educated to a still higher point of efficiency. When one of my brother dealers tells me that because he happens to own the store and the ground it stands on, and has no rent to pay, he therefore has very little overhead and can get along with a very meager margin of profit, I say he has poor business judgment and still needs enlightenment. In this respect I hope the day is not far distant when our association will have as part of its organization a fully equipped bureau covering extension courses in cost accounting methods.

We now pass on to the point where we see our dealer duly installed and his sign out over the door. I am not going to take the time here to inquire into his accounting methods or selection of stock. The former subject will be dealt with at a later session of this convention and we take it for granted he at least knows his trade. What is the appearance of his store? We hope it is neat, clean and well displayed. His store windows and glass show cases spick and span. The counters and floor clean, instead of being littered up with wire conduit, bushings and the Lord knows what not, as is, I am sorry to say, occasionally the case. He is on the job giving his retail trade as much attention as the contracting. If not, then he has a department on his hands that is not producing with an overhead that is eating up the profit which we presume he is making on the contracting end. We hope he is not contenting himself with merely standing behind his counter or at his door waiting for his customers to come to him, for as I said at the beginning the electrical game is in its introductory stage and the public must be educated to its uses. If Mr. Retailer is not doing something along this line in his section I am afraid he is doomed to a rough and rocky road. He must get the business coming to him. He must get acquainted with his neighborhood or section, study its needs, the best methods of approach, and having decided these, go after the business and pull it into his store. Once he has turned the current in his direction, the rest is easier of accomplishment. He should advertise, make himself known in and to the community. This may be done in several ways, the newspapers, letter-writing, use of circulars, membership in various social clubs and trade organizations, not forgetting his own store front and windows. In all this, above all else, he should stand forth and by courteous attention to those who come into his place, impregnate them with the fact that what he has said about his wares is the truth, the whole truth, and nothing but the truth. Then and only then, is confidence established, and when once established, success is assured.

Most of what I have already said refers to the man contemplating going into business. Now let us look at the man already in the field and who has been there for some time. No one here but will admit that he is showing and making progress for the betterment of conditions in the industry. In this work the jobber has played his part individually and collectively for closer co-operation. We must not be content, however. There are greater fields to be won. It is well these are not conquered too easily, for the

victory of battle is always sweeter when won by hard work. There is the question of retail service at a retail price. There is also the variation in prices of commodities carried by stores other than electrical. Investigation so far conducted has developed that this condition is due largely to the lack of appreciation of the real cost of selling the article, but in some instances it is of a purely destructive nature. It is believed that both the jobber and the manufacturer could and should use their efforts to remedy such evils of trade. Up to quite recently, we have not enjoyed the united help of the central stations in the endeavor to get this branch of the industry to appreciate that the retailing of electrical goods properly belongs to the electrical dealer. With the creation of the Pacific Coast Section of the N. E. L. A., and the pledge of their united support to this association given at the Riverside convention, marked progress is looked for from this direction, for which among other things, it should not be forgotten the electrical contractors and dealers form a large and permanent standing army, the proper and intelligent utilization of which can do much for the increased consumption so much desired by the central stations and with little or no cost to them.

Due to the present conditions, I believe that the retailing end of our business deserves the most vital consideration, for it is this portion which is so interesting to the central stations, as it is through this channel that the appliances must be marketed and this is what the central stations are interested in as they must build up the load on their lines.

As we are now asking the central stations to co-operate with us and discontinue the merchandising of electrical goods, we must get busy and do our part by taking hold of, and developing, this business, and use every effort to convert it from improper channels to the electrical dealer, thereby serving the public more efficiently, and through correct knowledge and good salesmanship create a greater demand for appliances. We must also take proper care of our customers in seeing that they get only the highest quality of goods, the just replacements on defective goods, and also give the proper service on repairs at honest and just prices. All of this will take a burden from the shoulders of the central stations, which they have been forced to bear for their own protection on account of the improper and inefficient channels through which these goods have been marketed in the past.

In this line we should keep the central stations foremost in mind, for I believe they can and will do more for the dealer in building up this end of the business than any other branch, therefore if we are expecting to receive, then let's begin by giving, for we only get out in proportion as we put in, and if we put in a goodly share of effort in this line, we will be sure to receive only the most good.

It appears to me that one of the most important steps in this direction will be the formation of some sort of publicity campaign and the creation of a state fund to properly advertise electrical devices and also advise the public through advertising to buy their electrical goods from electrical dealers and get the

service that they are entitled to when they purchase these goods.

I would also advise every electrical man who is doing any advertising whatever, to incorporate into each advertisement the phrase "Buy your electrical goods from an electrical dealer." I would also suggest that this be printed on the stationery of every electrical man, as I believe great good can come through this medium. I think each district of the state association should make a study of their problems from the retail standpoint and give their ideas of the causes and also their ideas of the best remedies, and send these reports into a standing retail committee of our state association, for their consideration and discussion with the other allied industries, with the result that a solution be found which would meet the approval of the entire industry.

I think every man who has any store at all should begin immediately to give the retail end of his business foremost thought; although at the present it may be the small end of his business, if he will begin by devoting a little additional time each day to this end of his business, discuss the situation with the men in his district, also his jobber and the manufacturer whom he is dealing with, with the idea of finding some way to increase his retail business, and if he will do this diligently and honestly, I am sure that it will not be long before he will see his business grow and feel that there is profit in this end of his business.

I sincerely hope that every man in the business will be able to report at our next annual convention that the retail end of his business has grown in leaps and bounds.

As a few suggestions to the man who has a retail store in the residential section, or I might say not in the main retail shopping district of the city, I would suggest that he procure from his jobber or manufacturer advertising matter and send the same out within the radius of which he does his business, and he will find that they will bring him results and help to build up his store business. This work can be done by a boy in the afternoons, at a small expense, and all helps to bring the people in his vicinity to the realization that there is such a store close at hand. Take one hour of an afternoon, and make a personal canvass of the people in your district, soliciting the sale of Mazda lamps, which is a very easy thing to work and which will give you an easy entre into a home, and leave a Mazda lamp advertisement with the statement that you will deliver Mazda lamps free of charge, and I think you will find that you will get some profitable business and also find that this will bring you other business besides that of Mazda lamps.

The above mentioned suggestions are intended for the man who has a store but who is convinced that the contracting end of his business is his livelihood and that the retailing business amounts to nothing and will not amount to anything until some miracle happens.

I believe that in a great many instances the reason that men are not getting much out of the retailing end of their business, is simply because they have not put their best efforts behind this line.

Now I want to refer to a few of my own experiences. As perhaps all of you know, about eighteen months ago I opened a store in a town where electrical dealers who had been there before me had decided that it could not be done. I found that there were eight Mazda lamp contracts which was a great deal more than was necessary for the size of the town, but with one exception, not speaking of the power companies, none of these people were doing much business in this line. I proceeded first to get the best location possible, which, although it was on a side street, was just off the main shopping district, and is amongst some of the retail stores. Next, I proceeded to make my store an up-to-date show-room and displayed a complete line of electrical goods in the very best manner that I knew of. Then I started in after the lamp business as I believe that this business will put you in touch with the public quicker than any other item in our business. As there were two power companies serving this locality, and both of them had different voltage, I put in two stocks of lamps, and I started off by making it a practice that whenever a customer came into the store, he was immediately asked what power company he took current from, and in the event that a messenger was sent who did not know, we would 'phone one of the power companies and inquire, explaining to each customer the reason for our question and why they should get the right voltage lamp. In the beginning I was surprised to find people refused to buy Mazda lamps, complaining that they were disgusted with them as they did not get any life out of them, and upon investigation I found the reason for this was due to the fact that with the exception of the central stations, the other merchants who were handling lamps carried only either one hundred and ten volt, or one hundred and fifteen volt lamps. After persistently plugging along the lines I have mentioned, together with newspaper and circular advertising, I succeeded the first year to make a twelve hundred dollar lamp contract, and today my lamp business is a very profitable one. I have advertised appliances also through the medium of newspapers and circulars, and also through show-window displays, and at the present time enjoy a very profitable business in this line. Although the hardware stores and a tea-store, and one of the central stations, are selling appliances, I have been able to get a goodly share of this business, and I attribute it to the fact that I consistently advertise the fact of buying your electrical goods from an electrical dealer. I have also paid a great deal of attention to the industrial business, and as a result of my efforts in this line, have recently been enjoying a very nice business in this line, and I would recommend that every dealer pay some attention to the industrial business and make every effort to get same, for the more of this that we get, the more we prove to the jobber that he can take care of it and convert same into the proper channel, which is the dealer.

I have mentioned the experiences which I personally have had, to call the dealers' attention to the fact that they cannot be too careful in handling the right goods so as to assist the central stations and relieve their troubles, and that by so doing it will prove profitable to themselves in the end.

THE PLOT FOR ADVERTISING MADE SIMPLE

BY H. A. LEMMON

(A chart for obtaining the essential points for emphasis in the local exploiting and advertising of electric appliances reduces the psychology of efficient advertising to the free and ready use of every electrical contractor and dealer. Here is an excellent chart, devised by the author, who is salesmanager for the Reno Light and Power Company at Reno, Nevada, and a well-known authority in such affairs electrical in the West. This article should be found unusually helpful and instructive in producing effective results in appliance sales campaigns throughout the West.—The Editor.)

Every advertisement must be an appeal to one person; because there are so many of him is why advertising can be made to pay. When you are endeavoring to sell to a woman in your shop you strive to find the point which will appeal to her and force that to the front. You don't weaken your talk by enumerating everything you can think of in favor of the article you wish to sell—that is, if you are a real salesman. Your skill in locating the proper appeal fixes your ability as a salesman. Advertising doesn't require so much skill, in this respect, because we can chart our woman and she becomes a mere incident. We don't have to guess anything.

First, who is going to use the article we offer for sale? Well, in the first column we have a few who might. Can you think of anyone else. I cannot, unless we add servants.

If some of them came into possession of it how would they benefit? Well, it probably would save something for them. About all that possibly can be saved is money, time or labor.

Suppose it saves money, what will such a saving do for them? Of course it brings profit. Equally well may a saving of money bring leisure or ease. Or suppose we say it saves time instead. What does a saving of time bring? Again it may bring either profit, leisure or ease, just as saving in money did. Perhaps you will say it saves labor. Doesn't a saving of labor also bring profit, leisure, or ease, or possibly all of them

The column headed "Appeal" represents the buying motive which we who write the ad must always keep to the front, and keep closely tied up to the last column wherein we find the person who is to buy the article. For example we may ask mothers to buy a device for their married daughters. We tell these mothers that the device will save "time" for their daughters and therefore bring them "leisure" which may be devoted to "enjoyment" or "health" and then we use the same column again to stimulate our imagination for a reason why the mother should buy the device. Possibly we will appeal to her "love" for her offspring, or her "pride," etc. We wouldn't think of

mailing a letter addressed to no one, and yet we launch many advertisements which are addressed to no one in particular.

The manufacturer and the general advertiser has a myriad of problems which the retailer needn't consider, and to which we will give no special attention; but we will assume that we wish to campaign suction cleaners for example.

Two things we must determine first: Who is to use it and who is to buy it for her. Perhaps we decide that of the persons set forth in the first column the housewife is most likely to use the device. If so we check

"housewife." Then we glance at the last column and decide who is to buy it for her. Her mother, her husband, her son or any one there may do so for her use, or we may decide that for our first ad she is likely to buy it herself. If so we check "housewife" again in the last column.

It is obvious that a cleaner will save both "Time" and "Labor" and by doing so must of necessity bring "Leisure" and "Ease." As we are appealing directly to the housewife who herself will use it, it is obvious that we will not check "Love," "Pride" and "Emulation" are possible appeals of course—for many articles are sold because the purchaser's neighbor has them. However, we will check "Enjoyment." Another in the series would be an appeal to husbands to eliminate the drudgery to which their wives are condemned and in that case the checking would remain the same all through except in the last column where it would appear after "Husband" and in the fourth after "Love" as we will appeal to the husband's love for his wife to prompt him to provide her with this very necessary device.

And so we automatically have the skeleton of our ad. We ask the woman, whom we charted, to purchase a vacuum cleaner because it will save time and labor for her, giving leisure each week for enjoyment. "Why of course" you say, "for what other reasons would she be likely to buy a cleaner." And there you have it. A good advertisement is almost invariably the obvious. Nothing is so unusual and so unexpected as the obvious. The chart holds to it. Glance through central station and dealers advertis-

Chart for the Advertising Plot

To be Used by	Saves	Brings	Appeal	To be Sold to
Housewife	Money	Profit	Love	Housewife
Mother			Enjoyment	Mother
Daughter				Daughter
Sister			Convenience	Sister
Husband	Time	Leisure (or pleasure, etc.)	Pride	Husband
Father				Father
Brother				Brother
Son			Health	Son
Friend	Labor	Ease	Emulation	Friend

ing generally and see what a small per cent of it really makes any personal selling appeal. We can write many more advertisements by varying the checks in the several columns; in fact any possible combination of check marks thereon will result in the foundation for a good ad.

That chart is worthy a great deal of study. It is so simple it might easily be dismissed without much thought, but the facts are that it embraces the outline of any possible good advertisement in the retail business—no matter what the business. It applies to dry goods just as well as to electrical appliances. Take any good retail advertisement—one that actually sells goods—and analyze it. You will find that very ad indicated on the chart as you check it off. Another interesting thing about it is that if you give a five-year old child a pencil and ask him to check off one or two items in each column—it doesn't matter in the slightest what ones he checks—the resultant combination provides the ground-work for an excellent campaign. Use the chart in another manner: Perhaps you already have written an ad that sounds good. "Sounds good" may be a costly deception. Test your ad by the chart. Read it carefully and see how many words you can check off. Who is to buy the article; who is to use it, and why should the one buy it and the other use it. If you find you cannot check off at least one word in each column, it will pay you to revise your ad until you can.

And now again we are right back to the plot, and here is where the touch of individuality and personality on the part of the dealer comes in. To merely say that the cleaner saves time and labor for the housewife is not enough. It is commonplace and rather, in the abstract. Strange as it may appear it does not stimulate the mental picture which is so necessary to accomplish the desired sale. So we will tell her how much time each day, or each week, it will save, and thus we visualize into a living statement what was merely a weak suggestion. It saves labor, but that means little. So we will spend a sentence which perhaps will not mention the word labor at all but will picture the back-aching broom and the muscle-racking dust cloth. In what manner does all this contribute to her enjoyment? The mere statement that a woman may save an hour a day doesn't mean so much to her as it does to a busy man. So we will help her to picture the enjoyment of that hour, and there your imagination and knowledge of women—perhaps your wife—will supply sufficient suggestion. One of the advertisements hereinafter mentioned suggests that it provides time to go to the movies. It might as well be the club, etc., etc. Another form of suggestion, and a very subtle one, is by a question, such as—

"Would you rather spend an hour each morning enjoying the world's most glorious music on your phonograph, or spend it sweeping a heavy carpet, and on your knees with a wearisome dust cloth?"

The answer is so obvious that the question becomes personal. The obvious always is personal. Now the lady who reads that question may not possess a phonograph and she may not enjoy "Canned" music;

nevertheless she will recognize the personal appeal, and she will say in effect—

"Well, I wouldn't spend an hour a day listening to the best phonograph made."

Very well; but as her brain will do the obvious thing, it will immediately grope about for an answer to the implied question she herself has raised: "How would I spend that hour every day?" Why I would read good books, or get outside in the garden, or any one of a dozen things which will appeal to her. If, however, we hadn't suggested some use for that hour we quite likely would not have whipped her brain into forming a picture of its enjoyment.

"Time," "labor," "leisure," "ease" and "convenience" are words so common as to mean but little by themselves to the average mind, but when we have energized them as outlined above, we will have an advertisement that every woman will feel was written especially for her. And that is what our advertising is for—to visualize the appeal.

How often you see, especially in small communities, advertisements running something like this:

Jones & Company

**Dealers in Hardware, Groceries and General Merchandise.
Cutlery, Provisions, etc. etc.**

Now in a general way that is probably advertising of a sort, but it is almost certain that Jones & Company will assure you that advertising doesn't really pay. Here is the trouble. When Mrs. Brown wishes to purchase a new pair of scissors she doesn't pick up the newspaper and wade through its columns to see who sells scissors. Possibly that announcement contains the elements of a paying ad, but they were not properly visualized. There is no plot—consequently no story.

Here is an advertisement that probably cost \$100 a day in the three large daily papers in which it was inserted for over a week by one of the big companies:

**GENERAL ELECTRIC
WESTINGHOUSE
HOTPOINT
HUGHES**

—Names known all over the world where electrical devices are used. They stand for tried and tested ideas; thorough workmanship; efficient and satisfactory products.

**ELECTRIC
RANGES**

—bearing these names are dependable; there is nothing experimental about them; we recommend them to our patrons as the best cooking devices made, barring none.

Almost any advertisement accomplishes some slight good, but the salvage in this case must have been a very small percentage of cost. It is entirely from the wrong viewpoint. It contains absolutely no appeal. Read it over, and together we will check it off on the chart. It doesn't seem to appeal directly to any one in the first column; so we will go on to the second. Probably electric ranges do not save money or time or labor, so we will pass up the sec-

ond column, and as there can be no third without the second we will go on to the fourth. What can we check here. Surely there must be some buying motive. Do you see any? Well, this ad must at least be intended for someone. "Who?" We cannot check a single word on the chart. The names of the manufacturers of electric ranges are not names to conjure with at present. Let each manufacturer strive to make his so if possible. That is his business. This advertisement is typical of the enormous amount of money wasted every year by central station advertising, and could never occur if its writer had followed some systematic plan of obtaining personal contact.

The Westinghouse company is conducting a very vigorous small appliance campaign at present. I don't know, of course, just what motive is behind it all. I have in mind particularly a recent one apparently seeking to popularize percolators. It was a full page, than any other words on the page, and so pronounced and the word Westinghouse was repeated three times in white letters on a black panel, many times larger and out of proportion that the eye caught nothing else. Now as a matter of fact the word "Westinghouse" was the least important of all the words in the ad. It means nothing to the average housewife and so probably very few of them read the ad at all. What the manufacturer should have done was to have pictured the delights and advantages ownership of a percolator brought and then tied in his own name so cleverly that the reader would take it for granted that if she purchased a percolator at all it must be a Westinghouse. I venture to say that ad cost a hundred dollars for every percolator it sold.

Comparable to Heinz's "57" we have the monogram "GE" of the General Electric Company. "57" tells its story and means something to every man, woman and child who sees it. On the other hand "GE" means nothing to the greater portion of our people. Why? Probably more money was spent to popularize the monogram than has been spent to make the figures famous. "57" excites the imagination. "GE" does not. The foundation was never laid to connect it in the public mind with anything in particular. Contrast this with the word "Mazda" presented by the same company. Mazda means as much as any trade name or design in the world—perhaps more. It has a story behind it.

Waste very little if any space merely making the article known. The manufacturer does that. Your task is to make its desirability or necessity obvious. You cannot write a poor advertisement if you follow some variation of the system set forth. In addition it will make you a better salesman. Also don't waste the manufacturer's booklets. He has prepared them at great expense. Sent out by themselves and unsupported by localized advertising effort they rarely bring returns commensurate with their cost. Used judiciously, however, and tied into local sales effort they are invaluable.

First of all put personality into your wording. Don't attempt to copy the style of other advertisers. Don't attempt fine writing. Your own vocabulary is sufficient. If you attempt to refine it you will have a result that is stilted and lacks the punch your

own conversation has. Remember it is the simple and the direct—the obvious—that sells goods through newspaper space. You are far more likely to make your ad too dignified than to make it too breezy. One of the peculiarities is that you can speak to a lady through your newspaper space in manner so light that it would be an offense in oral conversation. Some advertisements are so dignified that they are hardly advertising at all—merely pose. Some of the big jewelry firms illustrate this. Their pose is their biggest asset.

Now that we have our plot formed and our story written, the next, last and most important problem is to get people to read it. For no matter how scientifically we have advanced thus far our efforts are useless unless people will read them. Suppose any one of us picks up a fiction magazine—one without illustrations, what is our first step. We glance through its pages and make our first selection from the title. If the title appeals to us we read the story, all other considerations being equal. At least I do; don't you? This is not a studious age. We give things the "once over" and absorb what ideas we can on the run. Watch a man reading the daily paper. He reads by headlines. He takes in a page of advertisements at one glance and is conscious of none of them; suppose his own name appeared at the top of some announcement; would he stop and read it? Now we can't print the name of every newspaper reader at the head of our newspaper space; but we can concoct a phrase or a sentence that will arrest his attention, by reason of its personal application. In the San Francisco Examiner of June 9th we find this heading:

Art Posters Win Men to U. S. Service,
and in the article beneath these words: "That Uncle Sam Poster, by James Montgomery Flagg, which the recruiting service of the regular army has been putting up lately, has begun to bear fruit," etc. Let's examine it.

I WANT YOU
For U. S. Army
Nearest Recruiting Station.

So far as the picture of Uncle Sam is concerned it is merely conventional; so let's consider the wording. "I Want You." There is no "Now is the time for all good men to come to the aid of the Nation," but "I Want You." That about exhausts the possibilities of personal contact, doesn't it?

Here is a Liberty Loan poster issued by the government:

MAKE YOUR DOLLARS END THE WAR
Your Liberty Your Fathers Died For is at Stake
If You Can't Fight Your Money Can
Buy a Liberty Bond
and
Uncle Sam Will Do the Rest.

I doubt very much if it sold a single bond directly. You can't get in personal touch with it if you try. "Your Liberty your forefathers fought and died for" sounds good; but it doesn't have any great force as a personal appeal to most of us. It doesn't impel us to form a picture in our minds. The next line is better. Here is another:

Buy Liberty Bonds Here

U means YOU

S means SUBSCRIBE

A means AT ONCE

\$50, \$100, \$500, \$1000 Bonds.

Payments may be made in Installments.

Do Your Duty. Help Your Country.

Acrostics are, many times, interesting and to that slight extent useful perhaps; but personal contact is still lacking to a great degree.

YOU

Buy a

Liberty

BOND

This is better, inasmuch as it in itself furnishes a picture. Probably all of them could easily be improved.

I speak of these posters with some little experience. I managed the Liberty Loan Campaign in Nevada. The state oversubscribed its quota some 90 per cent; but we didn't get that result through these posters nor by the use of the formal, dry, plotless, difficult-to-understand literature of the government.

Having written the body of our ad to appeal to the one woman we have in mind, we are all ready to give it the eye-catching phrase which will compel attention, and which will force her to recognize a personal message. Let's illustrate:

MEASLES

That one word will attract the attention of every mother whose children are suffering from that disease, at the time she sees the word. Let's add a few words:—

MEASLES IS PREVALENT

A few more mothers with young children, will read the article. If, when the horrors of infantile paralysis filled the newspapers we changed our heading to read—

MEASLES IS MORE DANGEROUS THAN INFANTILE PARALYSIS

We would have given a number of mothers an unpleasant start, and would be nearer what we want for advertising purposes, except that it contains too many words. Three or four words at a time is all that the average brain will record from a mere glance.

YOUR LITTLE GIRL MAY DIE FROM MEASLES

Will get about the percentage of results in attention that we can reasonably hope for and we have about arrived at the peak of possibilities in interest-compelling headlines.

That heading will throw a chill into the heart of every mother of a little girl, and our audience is only limited by the number of mothers, of little girls, who see the advertisement. This line is still too long but the first three words "your little girl" will compel the extra effort required. It doesn't seem necessary to make any further analysis of these progressive steps in compelling interest and attention.

Unfortunately for us we cannot often make so strong an appeal as the life of children, but we can always make it a personal one. We can at least use the words "you" or "your." Your husband, your wife, your little daughter, your sweetheart, etc., makes your

message a personal one to every reader who comes within the class it is written for. Here are some headings from a manufacturer's advertisements which illustrate the principle: In Your Shop, In Your Home, Use Your Fan to Help Keep You Warm, Make Your Show Windows Sell Goods at Night, etc., etc.

A little less direct in wording, but not in thought, are these from the Society of Electrical Development: For a toaster, Having Breakfast with Daddy; for an electric iron, Be an Eight-hour Wife; for a Sewing Machine Motor, Now She Enjoys Her Sewing. This latter is worthy a word or two. Obviously it appeals to anyone who is considerate of, or loves "She"; so it would be a splendid wording if the check mark on our chart was on love. It appeals to the husband, the son, the brother and the father, the mother, the sister, and the daughter. Now, if, in a subsequent issue we rewrite the advertisement and change the heading to "You Will Enjoy Sewing" we will have made a direct appeal to everyone who can possibly be interested in sewing machine motors—from whatever standpoint save the professional dressmaker and the seamstress. To her the appeal may be addressed to facts relating to increased output which means more profit; and also to the small cost of operation.

Tricks in making phrases, smart turn of words are not advertising. A good advertisement may be written accidentally; but with the chart there is no excuse for a poor one. Another thing the chart will do. It will get the idea out of our heads that price is a paramount consideration in the disposal of electrical goods. We will find something else to appeal to; and will be agreeably surprised to find it more effective.

U. S. ENGINEERING AND TRADE EXPERTS IN THE FAR EAST

In evidence of the interest that the American government is taking in the Far East, the Bureau of Foreign and Domestic Commerce of the Department of Commerce now has trade commissioners at work in the Orient as follows:

A. W. Ferrin is investigating financial and investment conditions in the Far East and Russia. Mr. Ferrin, who has been associated with Moodie's Magazine, a New York financial journal, arrived in Japan early in June and is now traveling through Korea and Northern China.

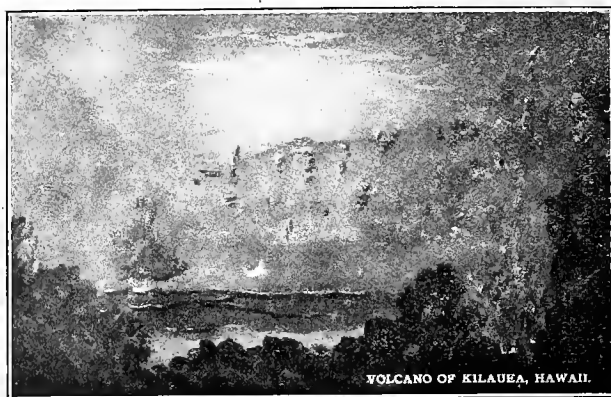
R. Lundquist is investigating electrical development and equipment matters in the Far East, Australia, Africa and the Near East. Mr. Lundquist, an electrical engineer of Minneapolis, arrived in Shanghai a few weeks ago from Australia. He expects to be in China and Japan during the next three or four months, when he will proceed to Malayasia and India.

Mr. Frank Rhea is investigating railway specialties and mechanical equipment matters in Australia and the Far East. Mr. Rhea, an experienced railwayman, stopped over in Shanghai a few weeks ago on his way to Japan, where he is now located. He will cover Korea, Eastern Siberia and China, returning to Shanghai in the early autumn, after which he will proceed to Malayasia and India. He has already covered Australia.

MECHANICAL ENERGY FROM VOLCANIC STEAM

(In Italy gigantic electric powers are being made available from certain of her volcanic regions. In view of the many similar volcanic sections in American possessions the following lines should prove of interest to engineers of the West.—The Editor.)

In the barren, desolate region in the vicinity of Volterra, in southwestern Tuscany, are a great many fissures or cracks in the earth's surface from which small clouds of steam arise, evidently of subterranean origin. Almost a century ago Francois de Larderel, a Frenchman, visited this region and made an analysis of this steam, and he discovered that it was heavily charged with boracic acid. Beginning at the Poggio Casa la Serra, extending south over the summit and down the valley of the River Cornia, he found numerous fissures from which steam arose. Selecting



The Giant Volcano of Kilauea, Hawaiian Islands

the largest of these, at what is now the town of Larderello, about 15 miles due south of Volterra, he established a plant for the extraction of boracic acid, which was the beginning of what is now a most successful industry.

In the present plant the vents are covered, the steam condensed by the air as it reaches the surface, and the resulting water is led in open, wooden troughs into shallow pans, where by the aid of certain precipitates and evaporation, boracic acid in crystalline form is obtained. These pans, lined with lead, about 6 ft. by 4 ft. and 4 inches deep, are in sets and arranged in steps on the slopes of the hill so that the water, delivered by troughs into the highest pan of each set, drains through each pan of the series and finally into a tank or vat. As evaporation proceeds, crystals of boracic acid are deposited along the edges of each pan, the edges being flattened and sloped so as to facilitate this process, from which they are gathered and taken to drying rooms and spread out on shelves to hasten drying. Both evaporation and drying have been assisted by the installation of pipes, much in the manner of steam-heating pipes, the steam used being obtained from the earth fissures. Steam from the same source is used to heat the offices of the company and the houses of the employees.

Several years ago it was decided to use some of the surplus steam from the fissures to operate a small horizontal engine. This was installed and used to furnish the small amount of power required for various purposes in the works and is still used as occasion demands.

When the low pressure steam turbine was invented it was seen that it might be possible to use this steam as a source of power. Vents were selected, borings made and it was found that no diminution of pressure resulted when the borings were made a sufficient distance apart, about 50 to 100 ft. Holes were then put down to a point where a pressure of from two to three atmospheres and temperature of from 150 to 190 degrees C. could be obtained from the steam. The power thus obtained was utilized for the production of electric energy which could be transmitted to neighboring towns. Additional capital was invested and a modern electric plant erected. Piped borings were made into the earth from which the steam is carried to tubular boilers. As the steam is highly impregnated with boracic acid, the tubes are of aluminum outside. The steam is applied to these tubes and the heat from it used to turn pure water, obtained from other sources, into steam which in its turn operates the engines connected with the dynamos. There are installed at present three groups of alternating turbines of 4000 h.p. each, producing from the dynamos a 3-phase, 50 period, 4000 volt current. The current is transformed into 16,000 volts for transmission to Volterra, Saline di Volterra, Pomerance, Castelnovo, and Montetondo, all near-by-towns. Current at the same voltage is delivered to the Societa Maremma di Elettricit  which delivers it as far as Follonica, on the west coast. For the two large customers—the Societa Elettrica Mineraria del Valdarno and the Societa Ligure Toscana di Elettricit —the voltage is increased to 30,000 and 40,000; the direct line for the first going by way of Colle d'Elsa, above Sienna, and the Central of Castelnovo, while that for the second goes by Cecina, on the west coast, and Castiglion Cello to the Central at Leghorn.

The company known as the Societa Boracifera di Larderello, has its offices in Florence and is controlled there. On a capital of 5,645,000 lire (over \$1,000,000) dividends at the rate of 5 per cent per annum are paid. The company spent 1,500,000 lire in 1915 on new construction. Outside of the power produced, it is stated that in 1914, 2537 tons of crude boracic acid, 739 tons of refined boracic acid, 1164 tons of borax, and 55 tons of carbonate of ammonia were produced. The steam is strongly impregnated with sulphur in one of its various forms, but this is eliminated when the steam reaches the open air.

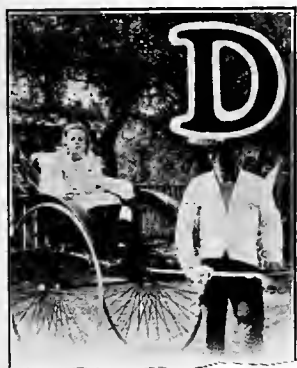
KEEP WATER IN YOUR BOILER

Boilers continue to be utterly ruined by low water. The Hartford Steam Boiler Inspection & Insurance Company shows that low water accidents are of the preventable sort, and no one would want at this time to feel that he had made the purchase of a new boiler at an almost fabulous price, necessary, when the old one might have served for many years to come if there had not been a lapse in its supply of feed water. Low water was never more inexcusable than it is today.

NATIONALIZING AMERICAN COMMERCE

BY H. B. MILLER

(Expansion of commercial and engineering relations with our Pacific neighbors is a question that is of prime interest to engineers and men of the electrical industry throughout the West. Here is an excellent article written for readers of the Journal of Electricity by the Director of the School of Commerce at the University of Oregon. In 1900, during the Boxer year, Mr. Miller, the author of this article, was sent to Shanghai as assistant to the Consul General. He was transferred from there to Peking and in 1901 was again transferred to Nausauing where he remained as Consul General for all Manchuria for four years. This was during the period of the Russian-Japanese war. During the war, Mr. Miller represented the Japanese government as well as the United States in Manchuria. Just before the end of the war, he was sent to Yokohama where he served this government as Consul General for five years. In 1909 he was transferred to the Consular Service in Belfast. He remained there only one year, having to resign owing to ill health. He returned to Portland in 1910 and has since made his residence here.—The Editor.)



Transportation Facilities near the Mikado's Palace in Tokyo

DOUBTLESS, the excellent trade supremacy throughout the world, which the United States possesses at the moment through the accident of war, will have to be held, if it is to be held at all, by adherence to a definite and aggressive foreign trade policy. It is true that this country is now carrying on the greatest over-seas commerce of any nation in the world, but this trade has not come through foresight or wise planning on the part of American statesmen, but through the fortunes of war—the misfortunes of other nations. When the war is over America's place in the sun may be quickly and completely obliterated. It all depends on how speedily our statesmen wake up to the situation and how effectively their constituents back them up in necessary legislative measures when they have been aroused to the situation.

Nationalizing American Commerce. By H. B. Miller

Trade supremacy throughout the world, which the United States possesses at the moment through the accident of war, will have to be held, if it is to be held at all, by adherence to a definite and aggressive foreign trade policy. It is true that this country is now carrying on the greatest over-seas commerce of any nation in the world, but this trade has not come through foresight or wise planning on the part of American statesmen, but through the fortunes of war—the misfortunes of other nations. When the war is over America's place in the sun may be quickly and completely obliterated. It all depends on how speedily our statesmen wake up to the situation and how effectively their constituents back them up in necessary legislative measures, when they have been aroused to the situation.

Expansion of foreign trade after the war, far beyond what we had at the beginning, will be imperative if we are to maintain domestic prosperity. We were already manufacturing far more than we could consume in this country before the war. The hard times we have been experiencing on the Pacific Coast for the past several years—up to the time of the present stimulation because of the war—was directly due to this condition. American lumber manufacturing plants can turn out annually some one hundred sev-

enty billion feet of lumber, and our domestic market calls for forty billion feet.

Our exports of manufactures in 1913 represented only 4.7 per cent of our total output. England, Germany, France, Belgium and Holland shipped abroad a total of manufactured goods equal to 60 per cent of their production. The record per capita exports of the United States—reached in 1913—were about \$25. Those of Holland were \$210; Belgium, \$100; Great Britain, \$53; Germany, \$33; and France, \$32.

A glance at the tabulated exports given below, will give an idea of the increase in raw products and manufactured goods.

United States Exports			
Exports in Raw Products and Food		Partly Manufactured and Manufactured Products	
1830.....	\$ 49,000,000 or 85%	\$ 9,500,000 or 16 38/100%	
1860.....	267,000,000 or 84%	48,500,000 or 15%	
1888.....	698,000,000 or 85%	122,000,000 or 15%	
1900.....	871,000,000 or 65%	485,000,000 or 32%	
1915.....	1,471,000,000 or 54%	1,163,000,000 or 43%	

A large part, probably more than three-fourths, of our foreign sales up to this time, may be credited to the operation of two forces: The foreign demand for raw products and food stuffs which could not be obtained in large quantities elsewhere, (and which find their way to markets as naturally as water flows down hill), and the efforts of a few large corporations. The total value of our exports of manufactures from 1900 to 1914 shows that the four groups of iron and steel products, refined copper, refined mineral oils and agricultural implements, constitute a total of 51.1 per cent in value of our total exports. In other words the four large corporations in this country—the Steel Corporation, the Standard Oil Company, the International Harvester Company, and the Copper Company, have by some means or other been enabled to concentrate and intensify their efforts so that their products represent a total average, over a period of 14 years, of 51.1 per cent of our entire manufactured articles. This restriction of our foreign trade to the exportation of raw products and the manufactured products of a small group of monopolies is not the kind of trade expansion that will bring general prosperity to this country. What we must do is to export far more manufactured products of vastly greater diversity.

Obstacles to Trade Expansion

There are several things that stand in the way of our foreign trade expansion on any permanent basis in this country and all of them hark back to a fundamental difference in the attitude of our people toward their government and the attitude of people of European countries. Other nations have the point of view

that the most important function of a state is to promote trade for its people—to plan economics in production, transportation and credit. In this country the attitude of our people is that the government should have as little to do as possible with the business of the nation. In other countries there is an intimate and close alliance between industry and government. In this country there is an absolute separation between them. Particularly is this true in regard to the three factors most important in creating and developing foreign trade, i.e., banking, shipping and business organization.

The Japanese government is perhaps the most perfect in its power of concentrating under central control these three necessary and most important elements for the development of a nation's foreign trade.

The United States is getting very much excited and unnecessarily alarmed by the thought that Japan's purpose is the development of her military power, her army and navy, so that she will be prepared to capture a part of the United States—at least the Philippine and Hawaiian Islands. Americans have a mistaken notion that Japan plans her line of progress and development exclusively through militarism. If we will study fully the marvelous development of Japan we will discover that the foundation of her growth is not militarism, but industrialism, her success being made in the fields of manufacturing and distribution of products for which her country and its environment are well qualified. She has no desire or purpose to set up a great military machine for the domination of any part of the world. Her main thought, her primary motive, her principal activities are all centered on becoming the industrial master of the Orient. Her progress in all lines of manufacturing and production indicates that this purpose is making wonderful progress. While it is true that she has a splendid army and efficient navy, she has the wisdom to realize that these things are necessary as a means of protection for her industrial growth.

Japan has patterned her organization along business lines after those forms of organization that have proved successful in European countries. Because of her concentrated power and the wisdom with which it is used by the Japanese government, Japan is now experiencing a marvelous development of manufacturing and a wonderful extension of foreign trade.

Bank Facilities Essential

The Japanese government controls the Bank of Japan, Yokohama Specie Bank and in fact all of the large banking interests of the country. The relationship between the banking and financial interests with the government is such that all of the powers of finance of the nation can be concentrated to exploit and develop any particular lines of manufacturing and production which seem essential to the progressive welfare of the nation. The government is equipped, therefore, to provide the necessary finances for extension of trade and banking interests into any country where her leaders think it advisable to extend them. Japanese banks under the direct supervision of the government have been established at important centers throughout the world.

Our own country has done nothing to provide

banking facilities for the aid of Americans in transacting business in foreign countries. There are now being established in some countries with which American firms do a large business, branches of one New York bank which is no more under the control of our government than any other National bank. The kind of organization under which these banks are being established does not indicate that they will be favorable to the extension of business from Chicago or other American cities. They are for limited New York interests.

In the matter of banking in foreign countries, as in so many other things, we have followed the policy of England. But even England, which has been so very conservative about giving government aid in the extension of her foreign trade, has finally come to see the wisdom of governmental control of finances for export business. British banks have been established in ports throughout the world for many years, but they have always been capitalized privately. Recently the British government has established a British Trade Bank, capitalized at two hundred fifty million dollars, and designed particularly to take care of the organization of British trade after the war. This has been done to offset a like move on the part of the Germans who have recently organized, with the aid of their allies, a great national bank with a capital of two hundred fifty million, already pledged in Germany alone. This bank will have exceptional privileges granted by all the powers in alliance with Germany, and will have much to do with the conduct of banking activities connected with the official control of the transition of German industry and commerce from a war to a peace basis.

Shipping Also Necessary

Take the matter of shipping. The need for American ships to transport American products has not yet become an ideal with us. Until that time comes, our exporters will continue to be under a heavy handicap. Until American products are sent abroad in American ships, our exporters will be compelled to submit to heavier freight rates than their competitors pay.

Not long ago the cement trade to Brazil was virtually closed to this country, after Brazil had passed a differential taxation, because the European shipping combination raised the rates from United States' ports.

In 1861, American ships, under our flag, carried 65 per cent of our commerce. In 1914 they carried 9.7 per cent. During the same year, the vessels of one foreign country alone, Great Britain, carried 53.7 per cent.

In this matter of transportation, also, the Japanese are particularly well prepared to utilize all facilities for the special development of Japanese trade and commerce. The government owns the railways in Japan, Korea, and Manchuria, and in all probability will become the permanent owner of the German railways in China. The Japanese are able, therefore, to give such rates of transportation of Japanese products as will insure their sale in any of the territory mentioned, as against the products of any other country competing with them. All of the leading steamship

lines of Japan are subsidized by the government and it is understood that the Imperial household funds are largely in control of these various steamship companies. They can carry cotton from the United States and India at whatever rate is necessary to keep the cotton manufactures of the country busy. The government can also regulate the rates of transportation of Japanese manufactured goods by the various steamship lines into markets, especially of the Orient, and even in Europe, where these goods compete with manufactures of other countries, equalizing any reduction in transportation by subsidies.

Owing to the effects of American shipping laws, ownership of ships in this country has become almost prohibitive. Comparison of the cost of operation of the Pacific Mail Steamship Company and the Toya Kisen Kaisha, shows that it costs the Japanese Company about \$227,860 less per year to run one of its fleet of four than it does the Pacific Mail Steamship Company to run one of its five ships. It is a well-known fact that in Germany the rate of transportation on the government owned railroads for goods to be exported is about one-half of the rate charged regularly for domestic shipments.

If the government does not take hold of this situation and in some way equalize the cost of shipping, we will have to stand by and see the American flag entirely driven from the seas, as has been so often dolefully predicted. The Japanese have already practically captured the shipping of the Pacific.

Organization a Requisite

Of even greater importance than questions of shipping and banking, if we are to formulate a workable foreign trade policy, are changes in our laws and in the attitude of the people toward business combinations. Undoubtedly the greatest obstacle to the development of our foreign commerce is the existence of powerful foreign combinations, aided and encouraged by their home governments, against which our exporters are helpless, because of the necessity for single-handed competition. The Sherman law, which was intended to safeguard small manufacturers against trusts in this country, has the opposite effect to that intended when it is applied to export business. Since small concerns are not permitted to combine for export, it follows that the large concerns are the only ones having the organization and capital for carrying on over-seas business. It is for this reason that so large a proportion of our foreign business is in the hands of the four corporations mentioned above.

The Federal Trade Commission has especially directed an extensive investigation of competitive conditions affecting Americans in international trade. The Commission has especially directed its investigation to the effect of foreign combinations on the export commerce of the United States. In the Commission's findings are these statements:

"In most of the great foreign nations, combinations of producers and dealers are more prevalent than in the United States, where the government has sought to safeguard the interests of the public by prohibiting combinations in restraint of trade. In Germany combinations of manufacturers and distributors are the rule. Cartels, syndicates, interlocking relationships, and price agreements are found in a large

proportion of the industries. In France similar combinations have been organized in many industries. In England, amalgamations and combinations of competitors are of frequent occurrence, although not nearly so common as in Germany. In Belgium and in Austria-Hungary before the war the entire industrial system as in Germany, was organized in cartels, *comptoirs*, syndicates, price agreements, etc. In Italy, Switzerland, Holland, Sweden, Russia, and Japan similar conditions exist to a less degree. In all these countries notwithstanding great differences of law, legal obstacles to the formation of combinations are either absent or much less than in the United States."

The Federal Trade Commission's report contains findings as follows:

"1. That other nations have marked advantages in foreign trade from superior facilities and more effective organizations.

"2. That doubt and fear as to legal restrictions prevent Americans from developing equally effective organizations for over-seas business and that the foreign trade of American manufactures and producers, particularly the smaller concerns, suffers in consequence."

The Commission's report states further that "if Americans are to enter the markets of the world on more nearly equal terms with their organized competitors and their organized customers, and if small American producers and manufacturers are to engage in export trade on profitable terms, they must be free to unite their efforts."

Again we have in Japan an example of concentrated effort in organization. The government loans to manufacturers of cotton goods considerable quantities of money to carry on this industry, charging them a rate of one or two per cent per annum. The government also manages the selling and distribution of the cotton goods so that there is no competition between the various Japanese manufacturers. They arrange for the manufacturers to put their products into the hands of the great commercial trust organization of Japan, the Mitsui Company, who becomes the selling agents. It is practically a great commercial trust organized to avoid competition amongst small manufacturers of Japan.

What must be done if America is to hold the leadership that the war has given her in the markets of the world, is that the entire nation must adopt and adhere to a foreign policy. This policy should embody changes both in the laws and in the attitude of our people toward banking, shipping, and business organization, in so far as they apply to foreign trade. To bring this about will require almost a complete reversal of our ideals, an entire change in the spirit of the American people. It will mean what we have heretofore looked upon as unholy—a close and sympathetic alliance of government and industry. But the time is ripe for the birth of a new plan and purpose in American national life. For the first time our people are beginning to think in terms of world politics and world commerce. A spirit of nationalism prevails as never before. Our leaders in statecraft and in business are already realizing what America will be up against after the war—a competition not of individual against individual nor of corporation against corporation but of nation against nation and allied nations against allied nations. Then, indeed, will the race be to the swift and the battle to the strong.

FAIR VALUE AND THE RATE-BASE

BY C. E. GRUNSKY, JR.

(Recent developments in the valuation of public utilities define more clearly the fair value and the rate-base together with a more definite statement of the position of the valuation engineer. Here is an excellent article on these matters by the vice-president of the American Engineering Corporation, which comprises a well-known group of consulting engineers in San Francisco. This paper, following as it does, the appearance of the series of papers of the elder Mr. Grunsky which have created such wide spread attention in the columns of the Journal of Electricity, should call forth unusual attention by valuation engineers.—The Editor.)

The extremely important subject of the proper basis for the determination of the rates of public utilities has been ignored in the final report of the special committee to formulate principles and methods for the valuation of railroad property and other public utilities in the proceedings of the American Society of Civil Engineers, December, 1916. This report states:

"That whether or not it is proper to base rates on the so-called 'value' of the property is no concern of the committee. The fact is that in many instances, including cases of railroad rates, the reasonableness of rates has been so determined, and in making their decisions in disputed cases, the courts have quite uniformly held that a public utility corporation is entitled to earn a 'fair' return on the 'fair value' of its property used in the public service."

In reading carefully the report of this committee, it will be noted that, true to this statement, consideration has not been given to the determination of the proper basis for rate-fixing.

To discuss at length here the report of this committee is not practicable, but it seems desirable to point out that the court cases quoted by the committee and by the authors of works on valuation are cases which review the proceedings of lower courts and which were instituted to decide the reasonableness of rates which already had been determined by commissions or other rate-fixing bodies. Although these cases fix with some definiteness the measure which shall be applied to determine the propriety of these rates, they do not restrict the rate-fixing body to any definite method of determining the proper rates. They do state, however, that the "fair value" shall be the basis of the calculation for determining whether these rates allow a return, fair to the rate-payer and fair to the utility. The fixing of rates is purely a legislative function and it cannot be exercised by the courts.

The case of *Smyth vs. Ames*¹ is a leading case in which the Supreme Court has set forth its view of the proper procedure in determining the reasonableness of rates. These views are in part as follows:

"The basis of all calculations as to the reasonableness of rates to be charged by a corporation maintaining a public highway under legislative sanction must be the fair value of the property being used by it for the convenience of the public."

The court in this case further states:

"And in order to ascertain the original cost of construction, the amount expended in permanent improvements, the amount and market value of its bonds and stock, the present as compared with the original cost of construction, the probable earning capacity of the property under the particular rates prescribed by statute and the sum required to meet operating expenses, are all matters for consideration and are to be given such weight as may be just and right in each case."

¹(169 U. S. 466, 1898).

This decision has been cited frequently since the date of its submission and the conclusion quite generally drawn that the method of fixing rates has been forever settled.

However, let us consider whether this is the case. The purpose of the court was one of review, to determine if confiscation had taken place or if the rates would create a value unreasonably high. In other words, it was necessary to determine value and the court says this is the "fair value" taking into account among other elements of value, the probable earning capacity of the property under the particular rates prescribed by statute and the sum required to meet operating expenses. It is self evident that the physical properties when considered separately have value for other purposes, but this is not the value which the court demands, the value of the entire property as an operating utility. Value properly determined, taking into account all its elements, is the result of earnings and not the cause thereof. The circle must be avoided. Rates cannot create value and then value be used as a basis for rates.

To point out in detail the difficulties encountered in attempting to justify the use of "fair" or "present" value as a basis for rate-fixing is not possible here. The conviction that such a method of rate-fixing is impracticable becomes fixed when we note, in the committee report previously mentioned, the segregation of physical property into three classes each requiring a different method for determining "fair value," the various methods adopted for determining accrued depreciation (lessening of worth) and the complex systems of accounting that are involved. The determination of "fair" or "present" value is rendered difficult by the hopelessness of attempting to determine the depreciated condition of the plant. Articles estimated as having a 20-year life will insist on failing to go out of use exactly 20 years from the date of installation. Some will go out of use very early in their expected life and thus unfairly deprive the utility of the annual depreciation on the article. Some articles of 20-year probable life may live to the age of 30 or 40 years. Shall these articles be allowed (assuming the straight line method) 1/20th of their value annually as depreciation during the full 30 or 40 year period? Accountants have adopted methods to take care of this depreciation, but as these methods involve either depreciation payments in advance before the failure has occurred or payments continued after it has failed, they are unfair either to the utility or to the public. And then, after all, it is lessening of worth determined by theoretical methods and not from the actual depreciated condition of the plant that has been calculated.

The Public Service Commission of Washington in a telephone rate case² decided April 26, 1916, says, regarding the unfairness of the use of fair value:

"It was never intended that rate payers shall be required to pay interest to the 'utility upon the added value of its property, resulting from a city's paving over conduits and mains and respondent here makes no such claim; yet such value must necessarily be a part of the 'fair value' of the property. The courts never intended to require rate payers to contribute additional returns to the utility by reason of all 'unearned increment,' which in many cases if considered as a part of the 'rate-base,' would result in rates absolutely prohibitive."

The necessity for allowing return on the "present" or "fair" value of lands lying close to densely populated centers in the watershed of municipal waterworks has in the past and is at present causing embarrassment to rate-fixing bodies. One example of the hardship resulting to the public from such ownership is the instance of a Western municipality in which the charge to the consumers caused by allowing 6 per cent interest on the present market value of watershed lands would be 10c per 1000 gallons. This amounts to about 40 per cent of what the total charge for water is at the present time. The actual price at which lands were purchased in the early history of the company was in the neighborhood of one-fifth of their present market value and the interest charge at the same rate (6 per cent) on an investment basis would in all probability be very much less than 10c per 1000 gallons.

A "rate-base" is that amount on which the owner of a utility is to be allowed a return and it should be the starting point in all rate-fixing procedures.

"Present value" has been used as a rate-base and found unsatisfactory because the depreciated condition of the plant which can be determined theoretically has no direct bearing on the rates that should be charged for the services rendered to the public.

The "rate-base" which is in every respect most satisfactory, is the legitimate, properly determined investment, undiminished by depreciation, but with due consideration to the cost of developing business. That this does not meet the decisions of the courts which demand "value" as the basis of the calculation should not mislead the rate-fixing authorities. They, as already stated, may adopt any proceedings in fixing rates that to them seem fair and proper. It rests with the courts to apply the "value" test when they are called on to determine the sufficiency of the rates, if this be the method they deem proper. In determining the rate-base, consideration may be given to early losses of the business treated as investment necessary to develop the business, to bonuses or gifts from the public and to capital which has been returned to the owner.

The rate-base furnishes the basis or starting point for the calculation, but in determining the earnings that should be allowed the skill and efficiency of the owner in conducting the business must also be taken into account. He is entitled to a share in the prosperity of the community to which the utility has contributed. Consideration should be given to the risks

²Public Service Commission of Washington vs Pac. Telephone & Telegraph Co. Case No. 1825.

of the business and to the fact that the business was started before the community was ready to assume the burden and the risk of operating a plant itself.

The Supreme Court of Idaho in reviewing the decision of the Public Service Commission of Idaho in the Pocatello Water Company case in 1915³ practically abandoned "present value" as a rate-base. The court states that

"So far as the question of depreciation is concerned, we think deduction should be made only for actual, tangible depreciation, and not for theoretical depreciation, sometimes called 'accrued depreciation.' In other words, if it be demonstrated that the plant is in good operating condition and giving as good service as a new plant, then, the question of depreciation may be entirely disregarded."

This decision allowed the utility a return on the undepreciated investment, holding that theoretical depreciation can be disregarded when unaccompanied by deterioration of service.

Along similar lines Mr. C. P. Cutten, attorney for the Pacific Gas & Electric Company, argued before the California Railroad Commission in 1914⁴ asking for a fair rate of return on the investment and a reasonable profit for the conduct of the business, claiming that there can be no possible inducement to develop business in new and untried territory unless sufficient return in the rates be allowed.

Although numerous arguments for some basis for the fixing of rates other than the depreciated value were made prior to 1915, no legal contention for the use of a rate-base, as such, independent of value, prior to that time is known. In November, 1915, Mr. James T. Shaw before the California Railroad Commission in a telephone rate case (Application No. 1870) argued that "value is a result and not a premise." He says that the premise we have been calling "value" is not value but is a rate-base, value being the result experienced from skill and integrity or the lack of them in the management of a property under rates determined from this base. Mr. Shaw contended for a "rate-base" which represents actual performance. Actual performance, he argues, is "a literal and itemized presentation of that which we own, compiled in the field by actual identification and count checked and verified by Commission engineers and representatives." Continuing he states:

"From this inventory, can be determined the physical factors to be appraised for inclusion in the Rate-Base * * * That which is excluded from the Rate-Base, if appraised at all, will be appraised only because of and with due regard to some of the elements of value first discussed. But whether appraised or not, it is foolish to say that it is without value. That which is included will be appraised, not for its value, but for its weight as a factor in the ultimate Rate-Base." The weight to be given that which is included will be, he states, "the Company's Actual Performance as expressed in actual investment in the now operating property used and useful in rendering the services that the people of California, through its railroad commission, now require of them."

In mentioning this case in its annual report⁵ the California Railroad Commission states:

³(150 Pac. Rep. 47, 1915, p. 50.)

⁴Town of Antioch vs. Pac. Gas and Elec. Co. Case No. 400.

⁵(July 1, 1915—June 30, 1916, Vol. 1, p. 84.)

"This proceeding necessitates a valuation of all the telephone property of this utility in the state, and also requires the determination of a proper rate-base * * *"

The decision in this case has not yet been rendered by the Commission.

The Pacific Telephone & Telegraph Company has made precisely similar contentions for a rate-base before the Public Service Commissions of Washington and Oregon. The decision in the Washington telephone rate case which was rendered on April 25, 1916, (No. 1825). Commissioner A. A. Lewis does not adopt as a principle the "actual performance" method of appraisal, but does concur with the views of the attorneys for the telephone company as to the necessity for the use of a "rate-base" distinct from fair value. The Commissioner states:

"That fair value if the words are to be used in their usual and ordinary sense cannot be the basis for rates, that a utility is entitled to reasonable compensation based upon the reasonable and necessary detriment suffered in preparation for and in the service of its patrons, and not upon values created by the public."

The Commission in its findings adopts a "rate-base" as the basis for fixing the rates. The decision made is:

"That the fair value of the respondent's entire property, or rate-base from which should be estimated the just, fair, reasonable and sufficient return to respondent as of December 31, 1914, is the sum of \$19,382,209."

This amount is more than the cost of construction and equipment (\$18,467,296.41), more than the cost of reproduction new (\$17,147,592.07), more than the cost of reproduction in its present condition (\$14,011,297.48) and it is less than the total market value of the property (\$22,000,000).

In this case the reproduction cost found by the engineers of the Commission as of date December 31, 1913, was \$16,765,383, and the development cost at 8 per cent upon the investment was \$2,396,400 as of same date. The sum of these two figures being \$19,161,783. The engineers for the telephone company found an "actual performance appraisal" based on the company's actual investment in the now operating property in the sum of \$19,246,088. The method by which the Commissioner obtained his figure of \$19,382,209 is not definitely stated in his findings.

The science of valuation is still in a formative stage and the rate-base distinct from "present or fair value" has only recently been recognized by the rate-fixing bodies. The following questions demand definite answer:

(1) Do the Supreme Court decisions make it illegal for a Commission or other rate-fixing body to use a rate-base, distinct from value, in fixing rates?

(2) Is not the use of the terms "fair value" and "present value" by the courts the result of the necessity for determining whether confiscation has occurred?

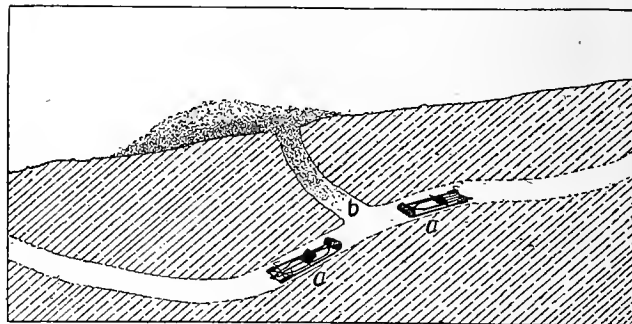
(3) If the earnings include a reasonable rate of interest return on the capital properly invested, due regard being given to the hazard, the compensation for management and the participation of the utility in the general prosperity of the country, can confiscation take place or can the public be deprived of any of its rights?

It is extremely desirable that engineers and economists direct constructive thought towards the fundamental principles of rate-fixing. Ignoring them at this time only postpones the final settlement.

TRAPPING THE GOPHER IN IRRIGATION PRACTICE

Much depends upon the economic efficiency of the modern electrical pumping installation in the manner in which the water is finally delivered to the furrows without loss.

In a publication just issued on the control of the pocket gopher in California by the College of Agri-



TRAPPING THE GOPHER

Here is shown at a the best place to set traps or leave poisoned bait which is in the main run as it is always kept open by the gopher. The lateral run at b is usually partly plugged with dirt, leading to the surface mound.

culture at Berkeley, a method is given that sets forth the best place to set traps or place poisoned bait for disposing of gophers. This is accomplished as shown in the illustration.

THE ELECTRIC MINE HOIST

In an exhaustive series of tests on a new electric mine hoist R. S. Sage of Butte, Montana, thus summarizes his work in the July Proceedings of the American Institute of Electrical Engineers:

A recent Ilgner-Ward hoist installation of considerable interest is that at the mine of the Elm Orlu Mining Company at Butte, Montana. The equipment has been in regular productive operation since the first week of last February having been put into commission to replace an old steam hoist at that time. This type of hoist but recently made its appearance in the Butte district, and the present installations are but fore-runners of many electrifications which will undoubtedly be made in the near future.

This equipment is of interest, first, because of its capacity, it being one of the two largest of this type in operation in this country, and, second, because of its unusual smoothness of operation, simplicity and ease of control, it being so noted throughout the Butte camp.

The efficiency of hoisting exceeded that anticipated; even with the light loads, the load per skip being but 80 per cent of that considered normal. With heavier loads, as when hoisting high grade copper ore, the efficiency would be further increased. Hoisting was done at slightly less than 50 per cent of the maximum rate for this level and the power

consumption was 2.49 kw.-hr per ton as compared with 2.83 kw.-hr., expected.

The tendency should be for the efficiency to increase at the greater depths, the maximum probably being reached at the intermediate levels.

SUMMARY OF INVESTIGATIONS ON HIGH TENSION INSULATORS

The committee on transmission and distribution appointed by the American Institute of Electrical Engineers thus summarizes its work in the July Proceedings of the Institute:

During the last few years the troubles with high-tension insulators have become cumulative. During the summer seasons of 1915 and 1916 the failure of insulators on some long distance transmission lines resulted so disastrously in the way of interruptions that it was evident something had to be done unless we were content to relegate long distance service to the category of intermittent or second class power. Particularly on the Pacific Coast these troubles had become acute. Some of our best engineers were already working on the problem.

What has been accomplished? The last word has not been said on any of these lines of investigation and will not be said for a long time. So far as porcelain insulators are concerned we know (1) that porosity must be reduced to the lowest practical limit to prevent absorption, (2) that joints must be so designed and made that the insulators will not crack from expansion and contraction effects, (3) That insulators must have ample margin of mechanical strength.

For the future activities of this committee, we suggest that it pursue the high tension insulator problem. The work has been started, but there is much to be done. Investigations so far indicate pretty clearly where the weaknesses lie and this is but one step from the solution of the problem. We suggest that further investigations be made on the subject of dielectric loss in cables to the end that the laws governing it may be definitely known. It will then be possible for the manufacturer to give an even quality of cable with minimum dielectric loss.

THE INCREASING VALUE OF LIQUID CREDIT INSTRUMENTS

An extract from a general letter of the National Association of credit men is interesting at this time of necessary credit expansion:

No thoughtful student of conditions will fail to recognize that the flotation of large public loans made necessary by the exigencies of war is likely to cause pinch no matter how earnestly we strive for that equality of distribution which our organization is advocating. The need of large credits is now evident, and this may be supplied if there were available with business enterprises liquid credit instruments, and not open accounts which are valueless in times of pinch and can only be used, generally speaking, at high rates of interest if borrowed against.

The situation so pregnant with new factors and appealing so strongly to the exercise of our best intelligence, suggests the adoption in the very largest

measure of trade acceptance as a substitute for open accounts in commercial credits. Personal objections to trade acceptances should be struck aside, in fact ought not to be advanced, for there are many reasons why these instruments are valuable to the buyer and seller alike, and for our credit defense there ought to be a willingness to ask and to give a liquid credit instrument that will be available in time of pinch for credit uses when the rigid open account will be valueless.

We submit this appeal, believing that the time has come for a general adoption of the trade acceptance plan.

BRITISH REPORT ON FATIGUE

As regards Sunday labor, the committee states that the evidence adduced has led it strongly to hold that if the maximum output is to be secured and maintained for any length of time a weekly period of rest must be allowed. Except for quite short periods continuous work in its view is a profound mistake and does not pay—output is not increased.

As regards hours of work the committee calls attention to the fact that overtime fell mainly to the lot of the most highly skilled workers (tool and gage makers, tool setters, etc.) as they are the most difficult to obtain. At one time cases of men working as much as 90 hours per week were met, and while more recently there has been a tendency to reduce the hours, weekly totals of 70 to 80 hours are still frequent. The committee is satisfied that hours such as these cannot be worked with impunity and most strongly urges that every effort should be made to extend the shift system to this branch of industry as rapidly as possible.

The committee has not found that as yet the strain of long hours has caused any serious breakdown among workers, but there is medical evidence to the effect that long hours are beginning to make themselves felt upon the older men and upon those who suffer from physical infirmity. There is reason for believing, however, that the better food that workers have been able to enjoy in consequence of increased pay has helped to counteract the strain of long hours.

Among the executives and foremen there is evidence of considerable fatigue, and numerous instances have been brought to the notice of the committee where men of this class have had to be allowed special holidays to enable them to recuperate. The committee, therefore, while recognizing that overtime must continue, suggests certain definite restrictions to which it should be submitted, especially in the case of women and girls.

As regards the work of women engaged in moderately heavy work the committee has come to the conclusion that in order to attain a maximum output such women should not work more than 60 hours a week. In fact, an equally good total output would be maintained if the actual working hours were reduced to 56 or less per week. For example, one group of operatives, 17 in number, worked only 51.8 to 62.6 hours per week for five weeks in June and July and during the last three weeks of this period their hourly output was 18 per cent greater than that of another group of 14 operatives who were working the usual long hours.

REVIEW OF RECENT ELECTRO-CHEMICAL PROGRESS

(Electro-chemical industries in England have received an unusual impetus during the past three years due to the trend of world events. In the West recent months have witnessed an awakening in this regard that is bound to bear fruit in enormously increased electrical loads in industrial development due to this electro-chemical activity. In view of this fact the summary of recent development of this industry in England as set forth on this page should prove interesting and profitable reading.—The Editor.)

In a recent address before the Incorporated Municipal Electrical Association, F. M. Long, president of the organization, thus reported recent progress of electro-chemical applications in the industries of England brought on largely due to the stimulus of the war:

Steel Furnaces.—Electric furnaces are now being extensively used in those districts where the manufacture of steel is carried on, and I may quote from some interesting notes given me by Mr. Fedden, of Sheffield:

"Since the end of 1914 I have connected 27 steel furnaces, ranging in size from 260 kw. to 3000 kw., making a total of 27,350 kw. Fourteen others are awaiting completion and connection.

"Showing the progress that furnace loads have made since the war, I estimate that by the end of next month (April) there will be at the rate of 85,000 tons of electric steel made per annum from this department's supply, making a total of approximately 100,000 tons per annum made in Sheffield.

"The chief factor in electric furnace development at the commencement of the war was due to the enormous quantity of steel turnings and the numerous other turnings in connection with war material.

"The majority of these turnings contain a good percentage of valuable alloys, and the greater portion of these would have been lost if the turnings had been melted in the ordinary steel furnaces. There is also a difficulty in dealing with these turnings in the ordinary steel furnaces, owing to their lightness and difficulty in handling, which is easily overcome in the electric furnace."

From a steel manufacturer I get this opinion:

"The advantages of making steel by electricity are that you can get a very much better control of the heat than in any other furnace, and that you are enabled to use turnings and other scrap in place of expensive hematite iron for the production of high-class steel."

Steel furnaces have been put down in many parts of the country, as in Birmingham, Bradford, Glasgow, etc., and there can be no doubt that developments will be very considerable in all steel-producing areas, absorbing very large quantities of power.

Air Nitrates.—Another development of very great interest is the establishment in Manchester of a factory for the manufacture of nitric acid from air, utilizing the new Kilburn Scott three-phase furnaces. The first plant to be erected, of an experimental character, will require some 1000 kw., but, if successful, it is expected that this may develop into a very large undertaking, ultimately requiring some 15,000 kw., and it will be a 24-hour day load.

Carbide Factories.—A carbide factory is being established at Manchester, the ultimate demand of which will be of the order of 10,000 kw., mainly of an

off-peak character. It is estimated that the consumption will run to from fifty to sixty million units per annum.

Phosphorus.—A factory for the manufacture of phosphorus will be starting at Wolverhampton next year, requiring 4600 kw., and another 4000 kw. will in all probability be required.

Arcorundum.—The manufacture of arcorundum has been started in Wolverhampton. This is an abrasive material similar to carborundum, made by fusing bauxite in electric furnaces. This is an entirely new industry in this country, and the plant at present consists of one 300 kw. furnace, with another going in shortly.

The above are a few instances of the use of electric furnaces, and there are others that cannot be referred to at present.

Beyond these larger uses of electric energy, it is interesting to note that there has been started in various parts of the kingdom the manufacture of articles that were formerly imported from Austria or Germany.

In a district in the south of England, supplied by a municipal undertaking, works are proposed, or have been started, for the production of substitute for aspirin, emollients, and other fatty medicinal products, phosphorous compounds, coal tar dyes, antiseptic and disinfectant products of the formalin class, plant for acetylene welding, acids, glycerine, etc., each of these requiring from 20 to 300 kw., and in the aggregate estimated to require five and one-half million units per annum.

Over and above the development of industries as above, which for the main part concern the larger towns, there is the question of the development of the use of electricity in agricultural areas, which is a matter that concerns small as well as large undertakings.

STREAM MEASUREMENTS IN COLUMBIA RIVER BASIN

One of a series of reports presenting the results of measurements of flow made on streams in the United States during 1914 has just been published by the United States Geological Survey, Department of the Interior, as Water-Supply Paper 392. The report represents co-operative work between the Federal Survey and the States of Washington, Montana and Idaho and gives the results of investigations of the streams that enter the Pacific Ocean in Washington and of the upper Columbia and its tributaries above the mouth of Snake River. The records include descriptions of the stations at which the measurements were made and tables of gauge heights and daily and monthly discharge.

Copies of Water-Supply Paper 392 may be obtained, without charge, by applying to the Director, United States Geological Survey, Washington, D. C.

ENGINEERING
COMMERCIAL

PROBLEMS AND SOLUTIONS

PUBLIC POLICY
ACCOUNTING

(High costs of electrical equipment and increases in wages are economic factors effecting the prosperity of the electrical industry in the West at the present time to a very vital degree. Here is a timely discussion on this subject by the general manager of the San Joaquin Light and Power Company. Other questions of timely interest are also treated by men of the industry, authorities in their respective lines. Engineers throughout the West are urged to send in perplexing questions of current import and also to take part in the discussion of these questions in this department of service that is being conducted by the Journal of Electricity.—The Editor.)

P. 3. "Do the high costs of electrical equipment, and increase in wages justify public service commissions raising rates for electric service? Would not such rate advances decrease current consumption to such a point as to make further raises necessary?"

A. G. Wishon, general manager San Joaquin Light and Power Corporation, Fresno, California: While not so egotistical as to assume that my suggestions will result in furnishing a "solution" of the problem, I am willing to submit my views thereon:

While all of us, officials included, are comparatively new in the matter of fixing just and equitable rates for public service, there are certain matters in this connection about which there can be no longer much doubt or discussion.

That is to say, that it has become very clear that intelligently distributed rates, fair to the consumer, tend to encourage wholesome consumption and are not prejudicial to the power companies. It is equally clear that if the rates are too low, and especially if they are badly distributed and scheduled, development is inevitably retarded and the ultimate result is beneficial neither to the consuming public nor the power companies.

While the phase of the matter under consideration, namely, the readjustment of rates after they have been once fixed, has as yet received no very exhaustive consideration, and much less application, I think it will ultimately become a matter of settled policy in the first instance to settle upon a correct and just valuation of all of the company's property used and useful in the service of developing and supplying power, including whatever rightly ought to be allowed for development cost or other properties that, although they are intangible or expensive of acquisition (and in this category including rights-of-way and water rights).

Such just valuation being arrived at, it will then of course be necessary to determine the necessary and proper expenses of operation and fixed charges, and thereupon a schedule of rates and correspondingly fair rules of service can be established applicable to the situation so ascertained.

The policy should be, not to disturb the basis of rates and operations so fixed, except where there is a very clear reason and necessity therefor.

Of course these valuations and increased cost of operation, will and should be kept practically up to date and constantly before the rate-fixing body, by full and complete statements and reports furnished and filed by the power companies.

While, as stated, the policy of avoiding changes, except in necessary instances, should be adhered to,

nevertheless, whenever it becomes clear that on account of a radical increase in value of properties and the necessary expense involved in extensions, maintenance and replacement, and where it appears that wages have been so radically advanced that the cost of continuing, carrying on and operating business has radically and definitely increased, then the very test by which the original rates and rules of service were established, call for and require a readjustment of rates to meet a definitely changed situation and to provide for the increased expenditures not compensated for by increased earnings. Of course, if it should appear that, notwithstanding the increased expenditures above referred to, the company's income had so increased that its position relative to meeting its expenses, and earning fair returns on its investment, was unprejudiced, then no change would be called for.

Looking at the matter broadly, it correspondingly follows that, if there should occur a definite and apparently permanent decrease in the cost of materials and labor necessary to maintain, extend and carry on the company's business, and if the other connected matters justified, a reduction in rates would be just as much called for and just as appropriate as an advance in rates.

No action I think in either direction should be sought or would be called for, unless the situation was definitely important and presented a real difficulty, and the probabilities were that it would continue either indefinitely or for a considerable period of time.

The settled policy, however, I think should be, that the Commission and the companies should stand ready always to fairly meet and honestly cope with a situation arising out of any positive and important change whereby the position became so different from that existing at the time the rates and service were fixed as to require action and readjustment.

In connection with such readjustment as in the fixing of rates, of course the problem would always be present as to where and how the increased or diminished rates should be applied, so that the change would not operate unjustly nor have the effect to decrease the volume of business, which would prevent rather than accomplish the desired purpose.

However, assuming that the present situation of radically advancing costs along all lines shall continue indefinitely or for a considerable period of time, undoubtedly some readjustment of rates would be proper. This if fairly and intelligently done would not imply much, if any, diminution in volume of business. For instance, oil, coal and other sources of energy, and the cost of producing the same, have so

radically advanced that competition is becoming next to impossible and the prices of agricultural and manufactured products and other commodities and necessities have so far advanced, that a fair and reasonable advance in the cost of electricity, if called for and if intelligently distributed and scheduled, would work no injustice to anyone. But I would not advocate this, except where it appeared to be a matter of extreme necessity and where all of the circumstances clearly justified such action and, in fact, almost demanded the same as a matter of necessity.

It may be, and doubtless will be, the case, with many if not all of the power companies in this State, that during the prevalence of existing high prices for labor and materials it will not be possible for such companies, under the present existing schedule of rates, to earn the net income provided and intended to be allowed by the Commission in the fixing of rates.

In this connection the suggestion occurs to me that, not knowing whether the present extremely difficult and exacting situation as to the cost of labor and materials will continue for any great period of time or not, if the Commission would announce the definite policy and intention of not hereafter reducing the rates until the companies were again earning the net income fixed and allowed, and also not until they had earned in excess of such allowed income an amount sufficient to compensate for the loss of income during the period of the continuance of the present exceptional conditions and costs of carrying on business, that this might represent the best present solution of a very difficult problem.

to be relied on by the power companies, it would aid

If this could be made known in such a way as in their financing and development and, at the same time, help the consuming public over the present critical industrial conditions and still carry with it the assurance that no permanent loss of fair earnings would be entailed upon the power companies. This, as stated, would help to keep their credit good, which may not be possible under existing rates and costs of operation, and would encourage investments and developments and at the same time would be distributed in such a way as to work no possible hardship on the public. And of course, if the present exceptional conditions of cost should be much increased, or long continued, then a reasonable increase in rates would be unavoidably necessary and under such conditions should be applied for, and should be, and we therefore assume would be, allowed by the Commission.

While undoubtedly any radical or badly-distributed increase in rates would decrease the current consumption to such a point as to make further raises necessary, the time may come when such increase will become an unavoidable necessity; and doubtless whenever that is true, a moderate, well-considered and equitably distributed increase in rates would not materially, if at all, decrease business, because the cost of hydroelectric power would still be much less than the cost of any possible substitute therefor and proportionately much less in cost than the cost of other commodities and necessities, all of which have so far increased that some relative, although not equally extended, increase may be unavoidably required in con-

nection with the service of electric power.

A. 1. What methods have been employed with success in collecting over-due accounts?

L. M. Klauber, San Diego Consolidated Gas & Electric Company, San Diego, California: A definite notice is mailed immediately upon expiration of the discount period. This contains a statement to the effect that if the bill is not paid within 15 days service will be discontinued. At the expiration of the 15-day period a collector calls on the delinquent and if unsuccessful in making the collection, cuts out the customer.

S. C. Haver, Jr., Southern California Edison Company, Los Angeles, California: We have found that the best way to attack this problem is to bend our energies toward preventing accounts from becoming delinquent. This can best be accomplished by a general campaign of education.

To teach our own organization to read, bill and present bills promptly, and

To teach our customers that bills are payable on presentation and to get them into the habit of paying promptly.

We require applicants for light or power service to establish credit in a satisfactory manner, or to furnish a guarantor or a cash guaranty deposit. We insist upon prompt payment, employing the "shut-off" notice if necessary. Appliances and other merchandise are sold only on conditional sales contract. These bills are presented invariably with the current bill for electric service. When not paid as agreed, we employ form letters and local collectors, requiring the return of the appliance, if it is not paid for in a reasonable time.

All larger accounts are brought to the attention of the Credit Agent, where they are worked by special letters, high-class collectors and, if necessary, by the Company's attorneys. We use every reasonable effort to collect without suit, but in some instances, especially where there is evidence of attempted fraud, an action at law is necessary.

On the smaller closing accounts, we send three politely worded notices, at intervals of about ten days, working in the meantime by the local collection force. This is followed by a special request for payment from the head of the Collection Department, with notice that if not paid by a certain date, the account will be handed to a collection agency. We employ a collection agency, reserving the right to dictate the method of handling and to withdraw an account at any time.

Frequently the collection of an account is facilitated by the acceptance of a note, secured or not, as the case may require, thus fixing the date of payment. The note is dated back so as to include interest at prevailing rates, from the time the account became due.

We co-operate with local credit organizations and bend our energies to collecting accounts when due, thus minimizing the number of past due accounts to be handled.

Ross B. Mateer, Southern Sierras Power Company, Riverside, California: An aggressive intelligent salesman is, I believe, the best collector any public utility can utilize. Turn the collections over to him and do not hamper him with routine or red tape

and unpaid accounts will seldom exceed one-half of one per cent for any given period.

E. 4. What pole height and spacing is advisable in building iron wire distribution lines?

L. M. Klauber, superintendent electric department, San Diego Consolidated Gas & Electric Company: In building iron wire distribution lines in suburban districts, it is ordinarily our practice to utilize pole spacings similar to those employed when copper is used. The pole spacings average about 300 ft. and 35 ft. poles are used in alleys and 40 ft. poles in the streets.

In agricultural districts, however, we take advantage of the greater tensile strength of steel and separate the poles more widely. In such districts our standard spacing on tangents is 700 ft. With this spacing there is naturally a considerable sag and we find that 40 ft. poles are the shortest that may be used with safety along country roads but across open fields we have sometimes used 35 ft. poles, particularly where it was possible to take advantage of the hilltops in rolling country.

The steel conductors which we use in the above described construction are 1/4 in., 5/16 in. or 3/8 in. double galvanized standard steel strand. On spans in excess of 1000 ft. where required by slough or river crossings, we prefer to use high strength steel.

E. 3. What is the impedance, reactance ohmic resistance and effective resistance of iron wire used to replace copper circuits for 2200 volt distribution work?

N. E. L. A. Question Box (July): The comparative resistances of iron and copper wire at 2200 volts are as follows:

Comparative Resistance of Iron and Copper Wire at 2200 Volts			
Current	Copper	E B B	Siemens-Martin
0	1.172	7.75	9.25
5	1.172	8.12	9.35
10	1.172	8.85	9.60
15	1.172	9.96	9.96
20	1.172	11.45	10.45
25	1.172	13.40	11.10

Unanswered Questions

P. 2. In what spirit should public utilities meet municipal overtures to take over local distribution lines?

C. 2. Should a central station operating in towns of 5000 population or less encourage the entrance of independent electrical dealers? What assistance might be extended them?

C. 3. What effect is anticipated on current consumption for electric cooking and water heating if the high prices and security of oil and coal continue?

P. 3. Do the high costs of electrical equipment and increase in wages justify public service commission's raising rates for electric service? Would not such rate advances decrease current consumption to such a point as to make further raises necessary?

POWER SITUATION IN GERMANY

Germany is well provided with "white coal." Formerly the utilization of this power was confined to the neighborhood of the stream itself. Electricity now furnishes a way to convert it for the use of distant consumers. The higher the tension and the smaller the cross section of the conductors the cheaper is the whole transmission system. At present it is possible to transmit 100,000 volts and more over a radius of many kilometers. Naturally the high tensions present greater

technical requirements—good insulation and firmness of the materials used in current conduction.

When a large district comprising several square kilometers is to be supplied with electricity, the plant must be so planned that the actual cost of production shall be kept as low as possible. It is a matter of experience in nearly all technical concerns that the actual costs decrease up to a certain limit with the increase in the size of the plant. This causes the preference for large undertakings in general and explains the favor shown to the large overland power plants in the electrical branch. The electrical industry considers it as one of its most important tasks to erect such plants in the immediate neighborhood of water power, coal beds, and peat bogs, thereby furnishing the current to the consumers under the most favorable conditions.

Experience has established the importance of various factors in the successful construction and operation of a large modern electrical plant. Large machines operate more systematically because their efficiency is greater. They require less space and less personal attention, e.g., the mechanical charging of large boilers and automatic regulation. The consumption of fuel and lubricating and cleaning materials is much smaller for a few large machines than for many small connected ones. A concentrated operation also saves operating expenses as well as wages of employes. Lastly, the purchase on a large scale of supplies, such as coal, oil, etc., can be made to greater advantage. This is further increased when the plant itself is situated in a coal mining district.

Bavaria was the first of the federal states composing the German Empire to consider a uniform production of electric current a proper concern of the state government. It has planned to provide this for all Bavaria lying to the right of the Rhine. The sources of power which will be used are the state plant on Lake Walchen (Walchensee in the Province of Upper Bavaria), the water power of the city of Munich, the Isar works, the Ampere works, the Leitzach works, the state Saalach power plant, the Lech electrical plant, and other smaller water power plants, as well as all the steam reserve plants of the electrical works mentioned, and the plants in Haidhof, Arzberg, and Dettingen, which are operated with brown coal.

Prussia already has owned for many years the large Muldenstein power plant in the Bitterfeld coal district and has obtained from it the electricity needed to operate the electric railroad between Dessau and Bitterfeld. It is now proposed that the state construct not far distant a still larger overland plant, near Wittenberg, with a total efficiency of 200,000 kilowatts, of which 140,000 kilowatts shall be used for running the electric street railroads of Berlin. The state will give the surplus at a price of 2.05 pfennings (about half a cent) per kilowatt hour to the Province of Brandenburg which has contracted to pay during the first eight year period of supply for at least 1,000,000,000 and during the second period for at least 1,640,000,000 kilowatt hours. The province already participates largely in the Markische Elektrizitätswerke and the Berliner Vorortselektrizitätswerke, which jointly supply about half of it with electricity. The proposed overland plant near Wittenberg will supply electricity to both of these concerns.

RECENT ADVANCES IN WESTERN WATER LAW

BY A. E. CHANDLER

(Recent cases relating to the appropriation of water as affected by the state school lands, the Carey Act and the powers of the state engineer as briefed in the following article emphatically show the necessity that each western state take positive action so that the lands held by the state for sale cannot become obstacles in the way of water project developments. The author of this compilation is a member of the California Water Commission and a well-known authority and writer on water right law.—The Editor.)

APPROPRIATION OF WATER

Colburn v. Winchell, Washington, 165 Pac. 1078.

The question presented in this case is whether a non-riparian owner may appropriate water from a non-navigable stream upon state land which has been granted to the state for the establishment and maintenance of a scientific school. A diversion had been made of the waters of Old Logging Camp Creek for use upon non-riparian lands, the diversion point being upon lands given to the state for scientific school purposes. The constitution of Washington provides that none of the lands (including "any estate or interest therein") granted to the state for educational purposes shall be sold otherwise than at public auction to the highest bidder. A long line of Washington decisions has fixed the rule that the right of a riparian owner to the waters of a non-navigable stream is an incident to his estate and is considered a part of the soil. In view of the constitutional provision and this rule, the Supreme Court concluded that the appropriation of the water from Old Logging Camp Creek by a non-riparian owner cannot be sustained under the constitution of Washington.

This decision places the State of Washington in a class by itself. The dual system of water rights (riparian and appropriation) is recognized in Nebraska, but the Supreme Court of Nebraska in *Crawford v. Hathaway*, 93 NW. 781, held that a Nebraska statute of 1889 authorizing the appropriation of water abrogated the riparian right for all public lands then unentered, either state or national. Another western state recognizing in part the dual system is Oregon, but the Supreme Court of Oregon in *Hough v. Porter*, 98 Pac. 1083, held that the congressional act of March 3, 1877 (the Desert Land Act), abrogated the riparian right for all public lands then unentered.

California is generally considered the state which has most rigidly protected the rights of riparian owners but the Supreme Court of California in *Palmer, etc., v. Railroad Commission*, 167 Cal. 163, in referring to the provisions of Section 1410 and following of the Civil Code providing for the appropriation of water, said, "So, also, the state, with respect to the lands it owns which are not devoted to a specific public use, is in the same category as any other landowner. It has riparian rights with respect to such land in the streams running over it, which its grant carries to the grantee. The provisions of the Civil Code above mentioned have the effect of a declaration by the state that any person who may divert water from a stream in pursuance of those provisions will thereby obtain a right in the stream paramount to the riparian rights

which the state may have therein by virtue of the fact that the stream may run over lands then belonging to the state. To that extent it operates as a grant from the state, but this is only because the state had the riparian right, and not because the water was in any sense public water devoted to public use."

State et al vs. Twin Falls-Salmon River Land and Water Company, Idaho, 166 Pac. 220.

The "Carey Act" is a congressional act providing for the irrigation of arid lands under contract with the state in which such lands are situated. In order to take advantage of the Carey Act, a state must pass legislation accepting the terms thereof and providing machinery for the construction and financing of the project. State legislation generally provides that the project shall be constructed by a construction company under contract with the state. Idaho has done far more under the Carey Act than any other state so it is not surprising that there has been far more litigation there over the terms of such contracts and over the operation of the projects.

The Twin Falls-Salmon River Land and Water Company is a Carey Act construction company organized for the construction of a project to store and use the waters of the Salmon River, which rises in Nevada and flows into the Snake River in Idaho. The original agreement between the state and the construction company provided for the irrigation of 150,000 acres of land. As construction progressed and it became evident that the water supply was insufficient for so large an area, the acreage was reduced. The contract was amended from time to time so that the acreage was reduced to 100,000 acres, to 80,000 acres, to 73,348 acres and finally to 40,000 acres.

The above entitled action was brought to compel the company to sell water rights for the irrigation of school lands sold by the state. The company refused on the ground that the water supply was insufficient for the acreage then covered by the contract. The vital question before the court was as to whether school lands have a superior claim to water rights over other lands embraced within the project. The court finally held that if such a preference exists, it must be found in the contract between the state and the construction company, and that, as the contract did not support the contention, the state lands had no superior claim.

As a somewhat casual remark by the court regarding those state offices which take a narrow view of their duties rather than one which conforms to broad public policy, the following words of Chief Justice Sullivan, who wrote the original opinion in the case, are worth while repeating:

"It seems to me quite clear that under the facts the state ought not to be permitted to succeed in this case, provided there is not sufficient water to irrigate all of the lands that were held in said project under valid contracts made prior to the sale of the land by the state to Rayl. No good reason can be offered why the state in its dealings with this matter should be unaffected by considerations of morality and right, which ordinarily bind the conscience, and the observance of honesty and fair-dealing on the part of the state may become of higher importance than reserving water for the irrigation of school lands, which water the state had consented to sell to the settler upon land which the state itself had sold to him. As was said in *Woodruff vs. Trapnall*, 10 How. 190, 13 L. Ed. 383, we naturally look to the action of a sovereign state to be characterized by a more scrupulous regard to justice and higher morality than belong to the ordinary transactions of individuals."

Tanner v. Beers, Utah, 165 Pac. 465.

In Utah, as is now so in most of the western states, in appropriating water an application is made to the state engineer who is authorized to approve such application if there be unappropriated water available in the source of supply. The Tanner case deals with an application made to the state engineer for ten cubic feet per second of the waters of Provo River. The applicant intended to secure the ten second feet by puddling and improving the grade of an existing ditch not owned or controlled by the applicant. As the state engineer believed that he had no power to grant an applicant a right to go upon and improve a private canal for the purpose of saving water lost by seepage, he rejected the application and the applicant appealed to the courts. Both the lower court and the supreme court upheld the state engineer on the ground that neither the state engineer nor the district court had the power to grant what the plaintiff demanded—that although the applicant's purposes to save water and apply the same to a beneficial use are to be commended, it could not be considered that there was any unappropriated water until the applicant had actually performed the suggested work upon the ditch and made the saving.

**EXPERT REPORTS ON TRACTION RATE
RAISES**

In the matter of electric transportation and the hearings that are soon to be in session in several districts of the West, it is of interest to follow the drift of the testimony in Eastern cases affecting transportation rates.

In recent opening before the Public Service Commission of New York, the cases of 28 interstate electric railway companies applying for an increase of fares from 5 to 6 cents, Professor Thomas Conway, Jr., of the Wharton School of Finance, submitted a statement based on reports to the Public Service Commission that more than one-half of the petitioning companies were not only paying no dividends, but they were not even earning the interest on their bonds and faced receivership if they obtained no relief.

Professor Conway also stated that from the reports to the Public Service Commission the net corporate income of 27 of the 28 petitioning companies despite an increase of total business had fallen from \$1,143,294

in 1912 to \$423,711 in 1916. Only seven of 28 companies showed an increase in net since 1912.

In the same period the interest on bonds in default had increased from \$11,875,000 in 1912 to \$374,007,000 in 1916. He also testified that 14 of the 28 petitioning companies failed to earn their fixed charges in 1916. Professor Conway testified that only three of the companies had income enough to enable them to market their securities. He stated that even a 6-cent fare would not make up for the loss of purchasing power of the nickel in the buying of supplies for street car service, and unless relief were granted sufficient to make the industry attractive to investors the companies could not keep up service, buy cars or other equipment, extend lines, and some must go into receivership.

Edmund P. Waller, manager of the railway department of the General Electric Company, and Roscoe Seybold, of the Westinghouse Electric & Manufacturing Company, testified that all kinds of electric apparatus used by street car companies, on account of increased costs of labor and materials, cost from 50 to 125 per cent more than in 1914.

Labor costs in the production of these supplies had advanced from 30 to 40 per cent since 1914; steel plates had increased as much as 700 per cent, copper 120 per cent, steel castings 100 per cent, steel forgings 340 per cent, coal 80 per cent, brass 200 per cent, etc.

W. G. Kaylor, of the Westinghouse Traction & Brake Company, testified that since April, 1917, air-brake equipment had increased 27 per cent in price, and James S. Thompson, vice-president of the American Brake Shoe & Foundry Company, testified to a 63 per cent increase in cost of brake shoes.

William H. Englund, of the Electric Service Supply Company of Philadelphia, testified that trolley wire, insulators, etc., had increased 200 per cent in the last three years due to increased costs of labor and material, especially copper.

Professor Roswell C. McCrea, of Columbia University, testified that labor costs had increased greatly in the last three years, and declared it practically a certainty that still more increases are near at hand.

In face of such testimony as this it would seem that should similar evidence be brought out in the West a readjustment of rates is essential to the very life of the transportation utilities.

**PRICES OF GAS AND ELECTRICITY IN THE
NETHERLANDS**

The high cost of coal has made it necessary to increase the prices of gas and electricity served by the Amsterdam municipal works.

Electricity has been furnished, according to the quantity used, at 12 to 15 Dutch cents for light and 8 to 10 for power (4.8 to 6 and 3.2 to 4 American, respectively) per kilowatt-hour. These charges it is now proposed to increase by 5 Dutch cents for light and 1½ cents for power (2 and 0.6 American cents, respectively). This increase, it is stated, is due less to the higher cost of production than to the fact that consumers of gas would be induced, by its increased cost, to change to electricity if its price were not also increased.

SUGGESTIONS FOR CONTRACTOR AND DEALER

DEPARTMENT CONDUCTED BY GEORGE A SCHNEIDER

(Working capital bears a close relation with promptness in collections from the patrons of the contractor and dealer. How this relationship may be vastly forwarded by systematic analysis is set forth on this page. In the installations of the contractor and dealer frequent use is found for auto transformers or balance coils. Here are also to be found data collected from the most recent advanced practice in the use of this important class of apparatus. Other hints for the contractor and dealer are also discussed on this page. The author is power apparatus specialist for a well known electrical supply house in San Francisco.—The Editor.)

WORKING CAPITAL AND COLLECTIONS

Due to the abnormal business conditions of the past few years, large commercial organizations have kept close watch over their credit accounts and the financial affairs of their debtors in general. This action is of course to be commended as it is a most effective means of limiting business failures. In general it has a tendency to stabilize business and keep it on a sound and profitable basis. Statistics show that many failures are due to lack of working capital. This statement is applicable to the electrical as well as any other line of business.

Since a sufficient working capital is so necessary to the success of any business it is obvious that when the capital is limited that every means should be taken to make the best possible use of every available dollar. There are many ways in which capital can be tied up so that it is not directly available for conducting the business. Among them, overbuying, often with the idea of saving money by ordering goods in large quantities; buying goods for which there is not an established market; buying goods which are foreign to the particular business conducted; taking larger contracts than the capital in the business really warrants and by numerous overdue outstanding accounts. There are many electrical dealers and contractors who realize the necessity of buying carefully and taking jobs within their capacity but who are very careless in keeping tab on their collections.

In the writer's opinion, the one reason why so many small electrical dealers and contractors are negligent with their collections is that they fail to make a systematic monthly study of the outstanding accounts and therefore do not realize just how long many of them are overdue. Every dealer should make a monthly study of this kind to determine the average number of days his customers take to pay their bills. Such a study requires but a little work yet affords a convenient basis for comparison from month to month.

For those who have not made an analysis of this kind a few suggestions as to the method of procedure may be of value. First take each individual unpaid statement and determine the number of days passed since the date of the bill. Then add up the total number of days for all the bills; and divide by the total number of bills. This will give the average number

of days for all of the accounts. A study of this kind made every month will then give a ready means of knowing whether the collections have improved or not. Preferably the average number of days should not exceed thirty, which is considered a good standard. After this has been done special and immediate attention should be given those accounts that are outstanding more than the average number of days.

At this time the matter of prompt collections is an important one. Every dealer should be especially cautious now and work for cash payments or shorter terms. Recognition of this fact will be the saving of distress in later days.

BUSINESS VEXATIONS AND SOME OTHER THINGS

Nine-tenths of human kind intend to be honest and are entitled to some commercial credit for the intention. The question is—How much?

Gauge a man's credit by his probable capacity to pay—hold him down to the amount—and you do much to keep him honest.

The careless extension of credit encourages disaster by leading a debtor beyond the depths of either his conscience or his capacity.

To make prompt collections requires tact and courage.

AUTO TRANSFORMERS OR BALANCE COILS

There are a number of questions which come up in connection with practically every transaction involving auto transformers or balance coils, such as are used with alternating current lighting circuits. In order of their occurrence, these questions are as follows:

(a) At what point, with reference to the lighting circuits or lamps, should the auto transformer be connected to the lighting system?

(b) How can the proper size be determined?

(c) Can they be used on poly-phase circuits?

Before discussing these questions in detail, let us consider briefly the construction of the auto transformer and its function. In general appearance and construction it is practically identical with the standard two winding transformer. It consists of a laminated iron core with suitable windings and an enclosing case. In the usual terms, the primary of the transformer is the winding across which the high tension voltage is impressed and the secondary is the winding from which the load is taken. These windings are electrically connected, in fact, under certain conditions there may be only a single winding with a suitable tap brought out.

The function of the device is to raise or lower the supply voltage. Only a portion of the power output of the auto transformer is actually transformed. On this account auto transformers are usually smaller and more efficient than regular transformers of a corresponding output and can frequently be used to advantage when only a slight reduction in voltage is required and provided both voltages are low. Auto transformers are used in connection with many elec-

trical devices but in this article we have reference only to their use as a balance coil to obtain a middle point, or neutral wire, for a three-wire alternating current system.

The connections of a typical lighting system using 115 volt lamps which are operated, in connection with a balance coil, from a 230 volt supply circuit are outlined in Fig. 1. As here shown, the balance coil is connected between the 230 volt supply service and the lighting circuits. It is generally most convenient to connect the balance coil at the point of entrance of the supply system, but if the system is a large one and the lamps are spread over quite an area, it is often more satisfactory and economical to place the balance coil nearer the center of distribution of the system.

This diagram shows a single coil balancer having the entire winding connected across the high voltage or supply mains, with a tap brought out at the middle point to provide a neutral wire for the system. In actual practice, the coil would be made up of two or more sets of windings properly interlinked with each other to eliminate magnetic leakage and thereby improve the regulation of the circuits. The actions within the coil are such that the voltages in the two halves of the coil are practically equal and remain so at any load within the capacity of the coil. Therefore, the lighting circuits are maintained at a voltage practically equal to one-half of the supply voltage.

With the connections shown the coil need only carry the difference in current between the two sides of the system, therefore the size of the coil would be determined by the degree of unbalancing of the system. This would depend upon the number of lamps and circuits and on several other factors. Ordinarily the capacity of the balancer will range from 10 to 25 per cent of the total connected load. When a small number of heating devices, such as glue pots, soldering irons, or the like are to be supplied, it is better practice to use a coil of somewhat larger capacity than the maximum percentage just given. It should also be noted that if the entire load is connected to one side of the system, the balance coil would need to carry the total connected load and its capacity would be determined accordingly. It is obviously more economical to connect the circuits so the coil need only handle the unbalanced portion of the total load.

The size of an auto transformer is expressed by stating its capacity or output in k.v.a. (kilo-volt amperes). With a 230 volt primary coil as shown in Fig. 1, this means the output at 115 volts 2-wire or the allowable unbalancing at 115-230 volts 3-wire. Thus a 2 k.v.a. balancer will carry a load of 2 k.v.a. on a 2-wire secondary system or will take care of any load on a 3-wire system provided the difference in load between the two sides does not exceed 2 k.v.a.

Standard auto transformers for the purpose outlined in this article as regularly listed by the various manufacturers are designed for single-phase, two-phase or open delta transformation. Two separate balancers are required for the two-phase or open delta connections. They are not designed to transform power three-to-three phase from 230 to 115 volts, ex-

cept an open delta connection, nor can they be used to transform three-to-two phase power as for this purpose special taps must be provided to obtain proper voltage ratio.

In dealing with auto transformers it must always be remembered that the high and low voltage circuits are electrically connected. Under these circumstances

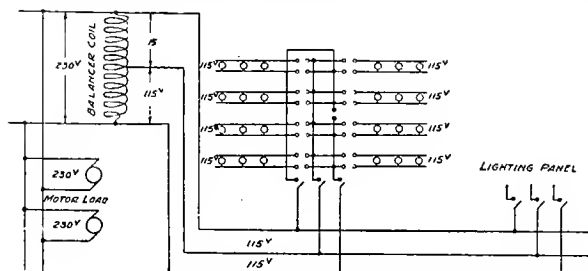


Fig. 1. A Method of Connecting Balancer Coil in Single-Phase Alternating Current Circuit. Where Three-Phase Lighting Circuits are Used, Balancer Coils May be Connected in Each Phase, but the Neutral Points Cannot be Grounded.

it is best from the standpoint of safety to consider both circuits as being of the higher voltage unless the circuit of lower voltage is permanently grounded. This point was discussed in this department of the Journal of Electricity in the issue of February 15th.

The subject of auto transformers is of particular interest at this time because the National Lamp Works have just issued a bulletin showing how to reduce operating costs by adapting 220-250 volt circuits to Mazda lamps of the 110-125 volt class. For this purpose auto transformers are very satisfactory on alternating current circuits. This publication can be secured from any jobber handling National Mazda lamps. It is known as Bulletin 31. The connection diagram used in this article is taken from that publication.

VOLTAGE FOR PROJECTOR LAMPS

Those who may have occasion to plan lighting installations should note that Mazda C flood lighting lamps with concentrated filament can be supplied only for use on 110-125 volts circuits. There are, however, a number of projectors now on the market which are designed to use the standard Mazda C lamps in sizes ranging from 300 to 1000 watts. In these projectors the lamps are burned in a vertical position with tip downwards but lamps with specially anchored filaments for horizontal burning can be supplied. The standard Mazda C lamps are made for 110-125 and 220-250 volts circuits.

ELECTRIC MOTORS SOUGHT FOR RAILWAY IN PERU

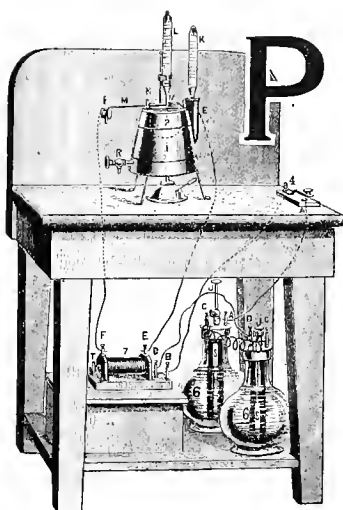
Sr. Benjamin La Torre, of Cuzco, Peru, has informed Commercial Attache William F. Montavon, at Lima, that he desires to obtain information with regard to electric locomotives from the United States for possible use on the Cuzco-Santa Ana Railway, an extension out of Cuzco of the Southern Railway of Peru. He is interested in both the construction and operation of the road. Although it will open up a region of some importance, he expects light traffic at first and suggests the possibility of using locomotives running on storage batteries.

FUEL OIL AND STEAM ENGINEERING

(Recent increasing costs of fuel oil make even more necessary than ever before a knowledge of the physical characteristics of the product. Especially do specifications for purchase enter with increasing importance into the economic features of power generation from this source. In this article the authors discuss first the fundamental characteristics of fuel oil taking into account its physical and chemical qualities and then are set forth eleven important points that should be taken into consideration when a purchase of fuel oil is to be made for purposes of power generation either for the central station or aboard ship.—The Editor.)

FUEL OIL AND SPECIFICATIONS FOR PURCHASE

BY ROBERT SIBLEY AND CHAS. H. DELANY



The Saybolt Electrical Equipment for Flash and Fire Tests

PETROLEUM has been known in the United States from prehistoric times. It is certain that the mound builders had wells from which petroleum was obtained. These are still in existence along with the most modern of our own times.

Petroleum was used as a medicine by many tribes of Indians. It was supposed to have many magical as well as medicinal properties. Its inflammable nature seems also to have been known.

No use was discovered for petroleum other than

as a medicine until in 1852, when a chemist, by the name of Kier, bethought himself of distilling it and extracting from it the more volatile portions. The American people took readily to the use of these oils as illuminating agents from the fact that for some time previously the mineral oils, extracted from lignites and anthracites, according to the process of Sellegries, the Swiss chemist, were in current use.

Enormous Consumption of Fuel Oil in the Industries.—The use of crude petroleum as a fuel for steam generation and power production has now an established position in all parts of the industrial world. Especially is this true on the Pacific Coast and in the southwestern section of the United States where the enormous yield of this product in Oklahoma, Texas and California now constitutes an ever-increasing factor in the total production of the world. Indeed, California alone with her yield of over one hundred million barrels in 1914 produced over 20 per cent of the world's output.

At its first incipency it was thought that the probable production of crude petroleum would be limited to but a few years. Due to this factor many power plants on the Pacific Coast were constructed so that an easy change over to operation by coal could be made should this time ever arrive. It is now recognized by many that the probable yield of oil will last as long as the coal fields of the world. Hence this uncertainty is largely dispelled in the industrial production of power.

Advantages of Crude Petroleum as a Fuel.—Oil has many distinct advantages over coal. Due to the simple mechanisms that are involved the cost for handling fuel oil is far less than for coal. By the elimination of stokers an important labor item is found unnecessary. Again for equal heat value oil occupies much less space than coal. Hence for ocean-going vessels it is especially applicable. Combustion too is more perfect, so that the quantity of excess air required is reduced to a minimum. The furnace temperature may be kept practically constant as the furnace doors need not be opened for cleaning or working the fires. Smoke may to a large measure be eliminated with the consequent cleanliness of heating surfaces. Again, the intensity of the fire is subject to delicate regulation and sudden load fluctuations are easily handled. Oil does not disintegrate or lose its calorific value when stored. In the boiler room the cleanliness and freedom from dust and ashes results in a saving in wear and tear in machinery. Hence it is clearly evident that the efficiency and the steaming capacity of a boiler, oil fired, is increased in a marked manner.

The disadvantages of fuel oil are of comparatively small moment. For this reason wherever oil can be obtained at a reasonable figure as compared to the prevailing market price of coal it has attained a marked popularity in steam generation and in the industries.

Let us then look into some of the physical properties of this new and important source of heat generation.

Liquid Fuels Classified.—Petroleum is practically the only liquid fuel sufficiently abundant and cheap to be used for the generation of steam. There are three kinds of petroleum in use, namely, those yielding on distillation paraffin, asphalt and olefine. To the first group belong the oils of the Appalachian Range and the Middle West of the United States. These are a dark brown in color with a greenish tinge. Upon their distillation such a variety of valuable light oils are obtained that their use as a fuel is prohibitive because of price. To the second group belong the oils found in Texas and California. These vary in color from reddish brown to a jet black. Since they are used extensively as a fuel in the United States, our discussion in this chapter shall largely be concerned with this class of oils. The third group comprises the oils from Russia, which like the second group are used largely for fuel purposes.

Physical and Chemical Properties of Oil.—Mineral oils as found in nature, are a mixture in indefinite proportions of several combinations of hydrogen and

carbon designated as hydrocarbons. Oxygen and sulphur are found in very small amounts. Nitrogen is found in a smaller proportion than the latter.

On account of the complexity of their composition, mineral oils differ considerably both physically and chemically.

Odor and Color.—Oil is generally found in a very fluid condition in North and South America, while in Russia and East India it is found in a very dense and syrupy condition. They all possess a characteristic odor while their color varies from amber or greenish yellow to dark brown. By reflection they are all greenish.

Effect of Heat.—Heat will separate the different hydrocarbons successively according to their volatility and cause them to dissociate at higher temperatures. Low temperatures will solidify these products, the highest freezing at a lower temperature.

Density of Various Oils.—The density varies from 0.765 to 0.970 compared with water at 4 degrees C., as found in nature (crude). Distillates will be much lighter.

Densities of Oils	
Origin of Crude	Specific Gravity
Persia	0.777
East Indies	0.821
Kyauk-Phyon (Burma)	0.818
California	0.960
Pennsylvania	0.850
South America	0.852
Russia	0.836
India	0.942
Terra-di-Lavors (Italy)	0.955
	0.970

Physical Properties of California Oils.—We shall now consider as a typical example a sample of California crude petroleum taken from an average of forty samples drawn from the Kern River oil field by representatives of the U. S. Bureau of Mines.

The specific gravity or density of fuel oil is an important factor to be known and is the ratio of the weight of an oil sample as compared with the weight of an equal volume of water. The average oil sample is found to have a specific gravity of .9645, which on the Baume scale at 60° F. is 15° 16. Hence, the average gallon of fuel oil weighs 8.03 lb.

The determination of the gravity of fuel oil and the relationship of specific gravity with gravities expressed on the Baume scale are of such importance that a subsequent chapter in this series has been set aside for detailed discussion and analysis.

The Calorific Value of Fuel Oil.—In steam boiler economy the heat producing value of the fuel per pound consumed in the furnace is of utmost importance. The average sample of Kern River oil generates or gives out 10,307 calories per gram, which

transferred to steam engineering units is found to be 18,553 B.t.u. per pound or 148,980 B.t.u. per gallon of oil.

This value is technically defined as the lower heating value. Oil, like water, requires the actual absorption of an enormous quantity of heat in its conversion into the gaseous state. Indeed the latent heat of evaporation for fuel oil is approximately 966 B.t.u. per pound under atmospheric pressure, as compared with 970.4 for the latent heat of evaporation of water as set forth in previous discussions. Hence, the actual heat given out by the average sample above referred to is approximately 19,519 B.t.u. per pound, but since we must gasify the oil to make use of its heat generating characteristics in the furnace the net value of 18,553 is solely of commercial importance.

The determination of the calorific value of fuel oil and the many computations involved are of such vast importance that several chapters have been set aside for future discussions of these various factors.

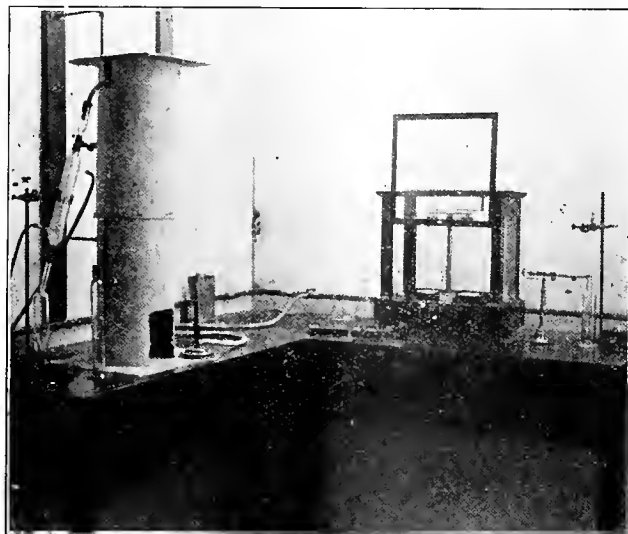
The Flash Test and the Burning Point of Oil.

The flash test of an oil is the temperature at which it gives off inflammable vapors. For the purpose of safety in handling, fuel oils should not give off inflammable vapors below 150° F. The flash point of an oil is determined by heating the oil in a vessel adjacent to which is a small flame. When the oil has been heated to a point where vapor rises and ignites from the flame, this temperature is called the flash point. The flash point of the average California oil is 108° C. or 226.4° F.

The burning point of oil is the temperature at which its ingredients will permanently ignite. This is determined by continuing the heating of the oil after the flash point has been ascertained until the "flash" becomes permanent, that is, until the oil ignites and continues to burn quietly. For the average Kern River oil sample the burning point is found by the open cup test to be 130° C. or 266° F.

Viscosity.—Some oils are more fluid or mobile than others. All are familiar with the difference between "cold molasses" and "hot molasses." And so in oil flow we have a similar

phenomenon. This tendency for the particles of oil to cohere to one another is known as viscosity. Viscosity is determined by measuring the time it takes oil to flow through a standard sized tube under standard conditions. On the so-called Engle's scale the average viscosity of Kern River oil at 20° C. is found to be 915.6. The viscosity is very materially lessened as the temperature is increased. Hence at once is



LABORATORY EQUIPMENT FOR FUEL OIL TESTING

In the gathering of fuel oil data for boiler tests the three things to be ascertained accurately are the specific gravity, the moisture content, and the calorific value of the oil sample. The principal pieces of apparatus necessary are the Westphal Balance, the chemist's scales, a Parr calorimeter, and a still with their accessories as shown. In the text of this article these physical characteristics of fuel oil are set forth. In later discussions the laboratory procedure in order to ascertain each of these points will be discussed in separate chapters.

seen the advantages of oil heating both for efficiency in transmission through long pipe lines, and for feeding the oil to the burners. In power plants the oil is heated to a temperature of 160° F. before reaching the burners.

Moisture.—All oils have a certain quantity of moisture present either in a free state or in the form of an emulsion, and its presence is always a hindrance to the full development of the heat producing qualities of the oil. Since this is a matter of great importance, the methods used in the quantitative determination of moisture present in fuel oil will be set forth in a subsequent chapter. The average Kern River sample contains about .5 per cent moisture. Hence the actual fuel oil ingredient is 99.5 per cent.

Sulphur, Gasoline and Other Ingredients.—All oils have a certain quantity of sulphur present. This sulphur has a heat producing quality, yet its deleterious effect in producing obnoxious gases and the corroding effect it has on the boiler tubes and other metallic parts makes a certain excess of sulphur most undesirable in the use of fuel oil. The average Kern River oil sample contains .83 per cent sulphur. There is no gasoline ingredient found in this oil sample. On the other hand, refined lamp oil appears to the extent of 6.6 per cent and refined lubricants to the extent of 39.2 per cent. The refining losses are 5.9 per cent and distilling losses, .5 per cent. The commercial asphaltum present is 47.3 per cent, thus indicating why California oils are known as possessing an asphaltum base.

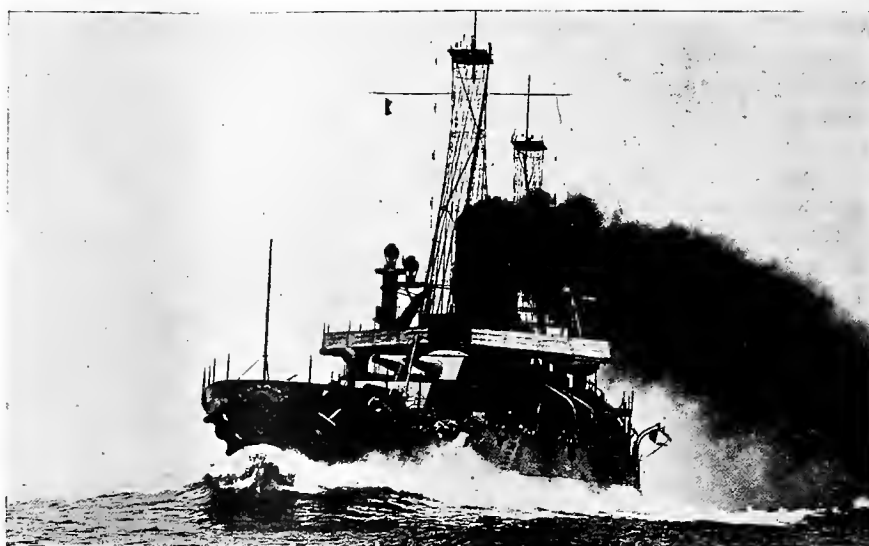
Specifications for the Purchase of Oil.—In the above discussion of the physical properties of fuel oil it is seen that the flashpoint, burning point, viscosity, heating value, moisture content, sulphur content, and other characteristics are fundamentally concerned in the commercial evaluation of crude petroleum. The United States government is a great consumer of fuel oil and below are given eleven important items established by the U. S. Bureau of Mines to aid the government in properly specifying its requirements for oil purchases. The points set forth are also of fundamental importance for the economic use of fuel oil in all steam boiler practice and the reader should carefully bear them in mind.

Specifications for Fuel Oil

(1) In determining the award of a contract, consideration will be given to the quality of the fuel offered by the bidders, as well as the price, and should it appear to be to the best interest of the government to award a contract at a higher price than that named in the lowest bid or bids received, the contract will be so awarded.

(2) Fuel oil should be either a natural homogeneous oil or a homogeneous residue from a natural oil; if the latter, all constituents having a low flash point

should have been removed by distillation; it should not be composed of a light oil and a heavy residue mixed in such proportions as to give the density desired.



"A GEM OF THE OCEAN"—U. S. S. MICHIGAN, SOMEWHERE IN THE ATLANTIC

Economic specifications for fuel used by the U. S. Navy have been given unusual attention in governmental investigations. The results of these investigations for fuel oil are appended in the discussion of this article and their application not only on the sea, but in the great steam auxiliary power plants of the West, will be found very helpful. This picture is furnished through the courtesy of the Philadelphia Section of the National Electric Light Association.

(3) It should not have been distilled at a temperature high enough to burn it, nor at a temperature so high that flecks of carbonaceous matter began to separate.

(4) It should not flash below 60° C. (140° F.) in a closed Abel-Pensky or Pensky-Martens tester.

(5) Its specific gravity should range from 0.85 to 0.96 at 15° C. (59° F.); the oil should be rejected if its specific gravity is above 0.97 at that temperature.

(6) It should be mobile, free from solid or semi-solid bodies, and should flow readily, at ordinary atmospheric temperature and under a head of 1 foot of oil, through a 4-inch pipe 10 ft. in length.

(7) It should not congeal nor become too sluggish to flow at 0° C. (32° F.)

(8) It should have a calorific value of not less than 10,000 calories per gram (18,000 British thermal units per pound); 10,250 calories to be the standard. A bonus is to be paid or a penalty deducted according as the fuel oil delivered is above or below this standard.

(9) It should be rejected if it contains more than 2 per cent water.

(10) It should be rejected if it contains more than 1 per cent sulphur.

(11) It should not contain more than a trace of sand, clay, or dirt.

Up to the middle of August nearly fifteen thousand carloads of lumber had been sent to the various army cantonments in the United States. The electrical construction work for these new housings of the national armies is of the same giant proportions.

SPARKS—Current Facts, Figures and Fancy

(Even from far off Japan word comes that gas has not in recent years kept pace with the popularity of electric light. This and other items of current interest to the men of the electrical industry are grouped on this page, which it is hoped will serve to give you further inspiration for the application of the method electrical in all affairs of human life.—The Editor.)

Carelessness is the short-cut to the grave.

* * *

While gas continues to go up, the popularity of the electric truck vastly increases throughout the West.

* * *

A most noteworthy advance in England which the war has directly brought about is the remarkable popularity which the electric steel furnace has acquired in a short period.

* * *

Manufacturers have found it necessary to discontinue the production of the 7½ watt mazda sign lamp because of the difficulty at the present time of obtaining suitable dies for drawing this particular size of tungsten wire.

* * *

Although there are some eighty gas companies with a capital of about forty million dollars which once occupied an important position in Japan's illumination, gas has not in recent years kept pace with electric light. The ratio of electric light to gas used by the people of Japan today, is about 4 to 1.

* * *

As a result of co-operation between the manufacturers of electric ranges and the central stations, the electric range has in a comparatively short time been firmly established on a successful commercial basis. It is estimated that this year's business will be in the neighborhood of three million dollars.

* * *

Electric range standardization has received an immense impetus due to the recent work of the National Electric Light Association. This matter is of great interest throughout the West due to the constantly increasing number of electric ranges that are being installed in this section of the country.

* * *

The wiring committee of the National Electric Light Association recommends that a 600-watt socket be installed in all kitchens so that an adapter can be used with which one can iron and use a lamp for illumination at the same time. By the use of these 600-watt sockets, the breaking down of the 200-watt sockets now generally used would be prevented.

* * *

The complete victory of the mazda lamp is noted from recent statistics. In 1907 the carbon and gem lamp business represented 99 per cent of the total sales; in 1916 the relative proportion between these lamps and the mazda lamp has practically been reversed, the mazda type representing last year 84 per cent of the total and the carbon and gem lamps, 16 per cent.

Selected California fruit, the result of the electrically operated pump, will grace the mess tables of British army officers in far away Egypt. The British government has placed an order for \$50,000 worth of canned apricots, the fruit to be delivered from canneries at Pomona, Hemet and Kingsburg in California.

* * *

According to the Electrical Review of Chicago, an electrically charged rod for driving cattle is being introduced upon some of the ranches of Western Texas. It is said to be specially suited for making rebellious cattle enter dipping vats, branding pens and other enclosures into which it is ordinarily a difficult matter to drive them. The rod is constructed with four dry cells and a coil and is equipped with a button by which the current may be turned on when it is desired to apply it to an animal.

* * *

"Industrially a city becomes famous only when its individual manufacturers make themselves famous." With this quotation as a slogan, the Chamber of Commerce of Philadelphia has started a campaign for industrial advertising by the use of electricity which is worthy of the serious attention of every central station and chamber of commerce in the United States. Incidentally it may be added that flood lighting has vastly assisted not only in advertising but protected the industrial plants of the nation during recent months.

* * *

One of the largest systems in the world is that of the Montana Power Company, which includes, at the present moment, thirteen hydroelectric and four steam plants, all tied together by means of numerous substations and over 1800 miles of transmission line. The hydroelectric plants have a combined generating capacity of 175,000 kw. and the steam-driven plants a capacity of 6000 kw. Another hydroelectric plant of 40,000 kw. is nearing completion, so that by the close of 1917 the capacity of this system will be approximately 220,000 kw.

* * *

One of the startling features brought out in a recent electric vehicle test was that the current used to drive the car from Atlantic City to New York cost less than half the price of enough gasoline to drive a gas car over the same distance. Two hundred and eighty-three ampere hours were used in the run, an average of 2.29 per mile, the cost of which, at a 5-cent kilowatt-hour rate, which is the maximum charging rate in New York City, would be \$1.55. With the low prices of power that prevail in the West, some indication of the future possibilities of electric vehicle loads is thus apparent.

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CONTENTS

The Northwest Electric Light & Power Association.....	197
The Whiteson-Corvallis Electrification. <i>By Paul Lebenbaum.</i>	200
Eastern Rates for Electro-Chemical Industries.....	202
The Extension of Electrical Systems in England.....	203
Retailing and Merchandising. <i>By W. H. Gribble.</i>	203
The Plot for Advertising Made Simple. <i>By H. A. Lemmon.</i>	206
U. S. Engineering and Trade Experts in the Far East.....	209
Mechanical Energy from Volcanic Steam.....	210
Nationalizing American Commerce and Engineering. <i>By H. B. Miller</i>	211
Fair Value and The Rate-Base. <i>By C. E. Grunsky, Jr.</i>	214
Trapping the Gopher in Irrigation Practice.....	216
The Electric Mine Hoist	216
Summary of Investigations on High Tension Insulators.....	217
The Increasing Value of Liquid Credit Instruments.....	217
British Report on Fatigue.....	217
A Review of Recent Electro-Chemical Installations in England	218
Problems and Solutions	219
Raising of Rates for Electric Service. <i>By A. G. Wishon.</i>	
Collecting Overdue Accounts. <i>By L. M. Klauber, S. C. Hacer, Jr., and Ross B. Muter.</i>	
Spacing for Iron Wire Distribution. <i>By L. M. Klauber.</i>	
Power Situation in Germany.....	221
Recent Cases Relating to the Appropriation of Water. <i>By A. E. Chandler</i>	222
Prices of Gas & Electricity in the Netherlands.....	223
Expert Reports on Traction Rate Raises.....	223
Practical Suggestions for Contractor and Dealer. <i>By George A. Schneider</i>	224
Electric Motors Sought for Railway in Peru.....	225
Fuel Oil and Specifications for Purchase. <i>By Robert Sibley and Chas. H. Delany.</i>	226
Sparks—Current Facts, Figures and Fancy.....	229
Editorials	230
The New Journal Service.....	232
Personals	233
Meeting Notices for Electrical Men.....	235
New Power Loads and Trade Notes	237
The Utility Companies in Finance.....	238
Latest in Everything Electrical.....	240
Books and Bulletins for Engineers.....	242
What Western Inventors are Doing.....	243
New Electrical Developments.....	244

LOYALTY

Loyalty, like the subtle magnetic force that interlinks the primary and secondary of the modern electric transformer, is the medium that makes possible the transmission of gigantic human energies for the performing of the world's work. Strip from your vision the selfish returns you picture will come to you in repayment for your effort, remove that mask of false pride of office or glory of insignia in the service of the nation, and if then you are impelled by an overpowering zeal to give of your all, either for your company or for your nation, it may well be said that you possess a measure of that all conquering force for which men of all ages have striven—namely, loyalty.

Continued reports from the Orient reflect the increasing commercial and engineering relations of all Pacific neighbors. It is interesting to summarize recent data contained in the commerce reports in this regard.

Take the case of Hong Kong, the great commercial center of southeastern Asia. A profitable trade based upon greatly restricted imports and exports was conducted during 1916 in the Hong Kong district. Trade with Europe was far below normal; with the United States, far above normal.

The chief feature of Hong Kong's import trade in 1916 was an increasing dependence upon the United States for many commodities previously obtained from Europe. In practically all lines of iron and steel manufactures—railway and construction materials, structural iron and steel, bars, sheets, rods, nails, and tin plate—the demand was limited by what the United States could supply.

The greatest increase in any one item of imports from the United States in 1916 was in iron and steel and their manufactures. There was a revival of the demand for railway supplies and equipment at the end of 1916 because of the exhaustion of the materials on hand and the necessity of maintaining existing lines in an efficient condition. Rolling stock for the British section of the Kowloon-Canton Railway is being ordered from the United States. The extension of the Sunning line is likely during 1917.

The unusually friendly feeling that exists between the citizens of China and citizens of the United States augurs much for ever increasing commercial and engineering relations in the future.

New Records in Steam Turbine Installation

When the new 15,000 kw. and the new 30,000 kw. steam turbine units, recently ordered by the Pacific Gas & Electric Company, are installed at Station A in San Francisco this steam power plant will not only become the largest in installed capacity in the West but other interesting features in recent evolution in design are to be noted that indicate the trend toward which steam power generation is moving. The large turbine is to use superheated steam of 150 deg. superheat at a pressure of 275 lb. per sq. in. Thus four distinct new records will be established in the West—the largest in size of single unit, the largest in combined installed capacity, the highest in superheat and the largest steam pressure.

Of course the boilers for the operation of this turbine will be of the latest design and their interconnection with the other fifteen boilers in this great plant will be necessary through reduction devices. Thus again a new record in boiler design in the West will be added to Pacific Coast practice.

Taken as a whole the problem is one of intense interest to engineers in steam power plant economy. As a side light, too, the installation of such enormous increased capacities speaks well for the industrial activity of this section of the West. Since the present growth of the Pacific Gas & Electric Company's load is at the annual rate of 12,000 kw. it is anticipated that even these additional capacities will prove inadequate long before the power supply from the great Pit River development can possibly be brought into San Francisco.

The Technical School and its Importance

In the editorial columns of the Journal of Electricity for July 15, 1917, comment was made on the technical schools of the West and attention was called to the necessity of a continued supply of young engineers to meet the World's problems that must be solved within the next two decades.

It is interesting to note that the National Service Handbook just off the press, which has been issued by the committee on Public Information at Washington calls forceful attention to this same line of thought, namely that it is most important that the engineering schools be not demoralized either in organization or in student enrollment.

In effect this publication states that modern warfare is so largely a matter of experts, experts in transportation, industry and organization, that a depletion of technical engineering forces would be comparable in its effects to the loss of an army corps.

The building of aircraft, of ships, the planning of camps, trenches, mines and roads, the organization of rail transportation for troop and supply movements, all demand an army of technically trained men. And after the war is over the allied countries are counting upon American aid. Our own industrial development, moreover, will be irremediably handicapped if our technical forces are not constantly fed. A breakdown in the engineering education of the country at this time would be a loss of one of the most essential instruments of industrial welfare and efficiency.

Indeed it would seem that the technical schools of

the nation are of such vast importance in the consummation of a successful termination of the world war and their product is to be such a potent factor in rehabilitating the after effects of the war that their proper administration should not only be uninterrupted but should receive especial attention and encouragement at this time.

Governmental and technical experts might well look into the character of the product that is available for such schools and by a process of selection from the elementary schools of the nation pick the proper material for entrance into the technical schools of the country and, when this choice has been made, see to it that every nurturing aid be provided to produce an even more select and highly trained body of men than ever before to meet the giant problems of industry that must be solved at the conclusion of the war.

A close scrutiny of industrial side issues of the war, in so far as it has affected our allies in Europe, brings to light many interesting features that should create pleasing pictures in the minds of all interested in the up-building of the great West, where such unlimited possibilities exist for industrial development due to a practically inexhaustible supply of possible hydroelectric development.

Off-peak Loads

In a recent issue of the London Electrical Review, editorial comment is made on the experience that has been gained by the war. In this comment it is set forth that the infinite flexibility and universal applicability of electrical energy have been abundantly demonstrated, that new industries have been created which require its service and that new conditions have arisen which will profoundly modify the progress of electricity supply in the future.

Especial reference is made to electro-chemistry and electro-metallurgy. The electric furnace, the driving of the refrigerating plant, the supply of power to farms, also came in for their recent wide application and finally it is noted that the charging of batteries for the electric vehicle is growing to be a valuable load due to its possibilities of off-peak application. This latter use, coupled with the manufacture of bleaching fluid by electrolysis, adaptable to off-peak service, constitutes a pleasing possibility for new business in the West.

In order that the electric vehicle and other off-peak service may come into its own in this section central stations must educate the public to even a higher degree than at present, to the infinite possibilities of electricity as an aid in their business.

And above all a factor enters that is too often overlooked, namely, the question of the rate that is given for off-peak service. Too frequently this rate is so complicated, although appearing perfectly simple and explainable to the valuation engineer, as to lose itself entirely in its application to the users' purposes. Talking in the other man's talk with the simplest and most commonplace expression within the gift of the English language is the only way that wide-spread off-peak uses can be made clear to the men unversed in affairs electrical.

By such methods alone can an early widespread use of off-peak service be hoped for in the building of the great West.

In these days of strenuous industrial activity throughout every section of the West, it is well for central station managers and power salesmen to bear in mind the great amount of temporary construction work that is going on in many quarters and see to it that electrical equipment receives its full attention.

Perhaps in no other section of the country has electrical equipment and appliances been used to a greater extent in all sorts of permanent installations than are to be found in this section of the country where hydroelectric development has been brought to such a high stage of development. However, even the casual observer finds that contractors and men operating construction plants, which are of a more or less temporary nature, have been rather backward in adopting electric power. This is probably due to the fact that steam and gasoline have been used more extensively and are familiar to practically everyone engaged in this class of work, while most contractors are of the opinion that the installation of electrical equipment is a more difficult job, so writes a contributor in a recent issue of *The Electrical Trade*.

That the sales department of western power companies might do well in bending more effort to this class of power load is an inevitable conclusion one must make, when a survey of this particular field in the West is noted. It might even be an excellent plan for the power salesman to keep better in touch with used machinery that could be readily made available in installations of this temporary character. The opportunity is a big one, and careful attention to its needs will prove unusually profitable.

Under the striking slogan, "Trolley Companies Headed Toward Receiverships," an unprecedented campaign of enlightenment is being conducted throughout various sections of the East by Joseph K. Choate acting as the chairman of a committee on ways and means to obtain additional revenue for the trolley companies of the nation. According to the statement of Professor Conway, Jr., the public utility expert of the Wharton School of Finance, not one-half of the up-state electric railway companies in New York State are earning even their fixed charges. Perhaps no single criterion could be selected which would more accurately reflect the unsatisfactory condition of the electric railway industry than the fact that since 1909, practically all new capital in the electric railway industry in New York State has been raised through the sale of bonds. When an investment ceases to be attractive for additional capital only by borrowing or mortgaging, the

patient is certainly not in a healthful state of mind to say the least.

This question of revenue for trolley companies is not only a serious one in the East but here in the West it is especially one that merits earnest attention. The advent of the automobile and the building of world wonders in highways have led the public generally to seek other modes of transportation than that of the trolley system. In addition to this fact the heavy increasing cost of labor and material have swelled the cost of operation of trolley systems far beyond their former bounds.

There is no question but that the situation is grave and that for the interurban lines new uses must be found to revitalize their field of usefulness. The handling of express and produce deliveries are proving valuable adjuncts to service in the Sacramento Valley and other districts of the West.

In the cities where such applications find little use, it would seem that a raise of income from passenger traffic is the only solution. The hearings that are to come before the various commissions of the West at an early date, looking toward increased transportation charges, will be followed with much interest by all who desire to see the electrical industry in the West receive its just and fair support from the public at large.

The Board of Fire Underwriters has prepared for the Council of National Defense, and are mailing to a list of some 66,000 of the leading manufacturers of the United States, a booklet of directions for the prevention of fire, under the title of "Safeguarding Industry," together with a show-card of fire prevention rules for employees.

The Prevention of Fires

This matter represents considerable labor and large expense. Its purpose is the highly important one of preventing fires in industrial plants which are working under the abnormal conditions of wartime emergency.

In the words of the President, preventable fire is more than a private misfortune. It is a public dereliction. At a time like this of emergency and of manifest necessity for the conservation of national resources, it is more than ever a matter of deep and pressing consequence that every means should be taken to prevent this evil.

Engineers and men of the electrical industry throughout the West will do well to secure a copy of this booklet and assist in this noble crusade against a common enemy—fire—that brings an annual irreparable loss to our national wealth that mounts up into hundreds of millions of dollars.

THE NEW JOURNAL SERVICE: The issue of the *Journal of Electricity* for Sept. 15, 1917, will be given over entirely toward featuring the convention papers and doings of the Northwest Electric Light & Power Association at Spokane. A beautifully illustrated eight-page article on the electrical applications at the Bunker Hill & Sullivan—the greatest lead-silver mine in the world, and perhaps the most superbly electrically equipped of its type in existence will be the leading feature of this issue. This plant will be made the place of official visitation for the convention delegates and friends.

In succeeding issues of the *Journal* a comprehensive review of present commission regulation throughout the West will be featured. Papers relating to the greatest problem ahead for the upbuilding of the West—the electrification of the great transcontinental lines—are also in course of preparation.

PERSONALS



A. W. Leonard, president of The Puget Sound Traction, Light & Power Company, and a well-known builder of the electrical industry in the Northwest, who has recently been widely quoted for his broad ideas in formulating a war policy for utilities, is actively engaged in promoting interest in his district looking toward sending a representative and enthusiastic group of men of the industry to attend the Spokane convention of the Northwest Electric Light & Power Association, Sept. 12-15, 1917. The special car of California guests to the Spokane

convention, will visit the scene of Mr. Leonard's activities at Seattle on Monday, Sept. 10, arriving at Spokane some time Wednesday. Among those who have thus far signified their intention of making the trip from California to the Spokane convention are H. F. Jackson, president and general manager of the Sierra & San Francisco Power Company and president of the Pacific Coast Section N. E. L. A.; T. E. Bibbins of the Pacific States Electric Company; S. V. Walton, commercial department Pacific Gas & Electric Company; J. A. Vandegrift, Mazda Lamp Works, Oakland; H. E. Sanderson, Bryant-Perkins Co.; Garnett Young of the Telephone Electric Equipment Co.; H. F. Hartzel of Baker-Joslyn Company; H. Noack, Pacific States Electric Company; Frank Fagan of the General Electric Company; Miles Steel of the Benjamin Electric Mfg. Company; W. S. Berry of the Western Electric Company; W. M. Deming, business manager Journal of Electricity; and Robert Sibley, editor Journal of Electricity. Several other central station men are yet to be heard from who contemplate going on the trip.

C. E. Johnson, of the American Eveready Company, Los Angeles and wife, were in Seattle early in August, on a vacation trip.

C. P. Herring, formerly of the Hallidie Machinery Company of Seattle, is at Monterey, Cal., as first lieutenant of the Signal Corps.

George Koch, city salesman American Eveready Company, San Francisco, has been taking a vacation in the Puget Sound country.

Jiro Komiya, electrical engineer to the Imperial Government Railways at Tokyo, is a recent San Francisco visitor en route to Japan.

Max Loewenthal, manager of the United Trading Company, has returned to San Francisco, after a four weeks' tour of the Northwest cities.

George F. Triffle of the Seattle office of the Westinghouse Electric and Manufacturing Company has left for California as first lieutenant, U. S. A.

Henry R. Stevens, member of firm of Stevens & Rockwell, electrical and mechanical engineers, Seattle, is taking an outing at Scenic Hot Springs.

G. E. Swett, sales agent General Electric Company, Seattle, has returned from a two weeks' vacation spent in yachting among the San Juan islands.

Nathan A. Bowers, Pacific Coast representative of the McGraw-Hill Publishing Company, has left San Francisco for an extended trip through the East.

H. B. Langille, assistant professor of machine design at the University of California, has resigned to engage in naval construction work during the period of the war.

J. F. NePage, of NePage, McKenny Company, electrical engineers and contractors, Seattle, Portland and San Francisco, is spending his vacation at Gearhart Beach, Oregon.

Herbert Hoover, a consulting engineer of world-wide reputation, and a member of the San Francisco Engineers' Club, has been appointed food administrator by the President.

Geo. A. Campbell, general manager of the Truckee River General Electric Company at Reno, Nevada, recently motored over to San Francisco and is now again in his home city.

R. J. Cash, manager of the Los Angeles office of the General Electric Company, recently passed through San Francisco on his way to a two weeks' outing in Northern California.

E. B. Strong, president of the Technical Publishing Company, publishers of the Journal of Electricity, has left for a business trip to all the larger manufacturing centers of the East.

R. L. Rockwell, of the firm of Stevens & Rockwell, electrical and mechanical engineers, Empire building, Seattle, has returned from a two weeks' vacation spent on Bainbridge Island.

V. S. McKenny, of NePage, McKenny Company, electrical engineers and contractors with offices at Seattle and other Pacific Coast cities, is taking a vacation at Lake Sutherland, Washington.

Chas. H. Quinn, chief electrical engineer of the Norfolk & Western Railway of Roanoke, Va., is a San Francisco visitor. The length of Mr. Quinn's sojourn on the Pacific Coast is indefinite due to the serious illness of his father.

Carl A. Heinze, assistant electrical engineer, department of Public Service at Los Angeles, has resigned to accept a commission in the national army. **H. C. Gardett** of the Bureau of Power and Light, has been appointed to Mr. Heinze's position.

D. E. White of the railway department, Westinghouse Electric & Manufacturing Company of Seattle, is attending the United States Aviation School at the University of California, having enlisted in the department of Military Aeronautics.

R. M. Alvord, western manager of the supply department of the General Electric Company, has left San Francisco for a six weeks' business visit in the East, during which time he will attend a meeting of the district supply managers of his company.

F. W. Gay, formerly a consulting engineer of San Francisco and the Pacific Coast Correspondent of the J. G. White Engineering Corporation, has left for New York City where he is to be the Atlantic District manager of the Pelton Water Wheel Company.

A. E. Chandler of the California Water Commission, has returned to San Francisco after a delightful trip with **F. G. Baum**, consulting engineer for the Pacific Gas & Electric Company, into the Pit River country in Northern California where is being initiated the great Pit River development of the Pacific Gas & Electric Company.

Roy Worth, assistant treasurer Pacific States Electric Company, Seattle, has returned from a vacation trip spent in the Puget Sound country and British Columbia. He was accompanied by Mrs. Worth, also **R. W. Wiseman**, leading electrical contractor of Ellensburg, Washington, and wife.

J. W. Swaren, formerly with the engineering department of the Pelton Water Wheel Company at San Francisco, has received his commission as captain in the Engineer Officers' Reserve Corps and has been assigned to active duty at the Vancouver barracks as instructor.

W. L. McKinley, commercial agent, Sierra & San Francisco Power Company, is at his office again following a short

stay in the hospital as a result of an automobile accident in which his spine was wrenched near the Stanislaus power house of his company.

Jay H. Keller, a consulting engineer of Seattle, is one of the three men picked from the Thirteenth naval district to undergo the three months of intensive training at the United States Naval Academy at Annapolis, preparatory to being commissioned in the navy.

John B. Redd, formerly an industrial engineer with the Pacific Gas & Electric Company at San Francisco, is opening an office in Los Angeles as sales engineer for the gas industry department of Davis-Bournonville Company, manufacturers of oxy-acetylene welding and cutting apparatus.

S. G. Hepler, of the Arrow Electric Company, Seattle, recently returned from a 60-day trip through the South and East, in the interest of business. Among the cities visited while away were: New Orleans, Chattanooga, Washington, D. C.; Philadelphia, New York, Chicago, Salt Lake, Los Angeles, and San Francisco.

Frederic D. Nims, manager of the Marshall interests of Boston and operating properties at Monteseno, Edmonds, Vashen, Arlington and other Washington towns, is back from an eastern trip and busy on new improvements. Mr. Nims is well known as former engineer for the Western Canada Power Company and an active member of the Institute.

Allen E. Ranson, electrical engineer, who has been active in the Northwest electrical field for the past sixteen years, is among the engineers recently commissioned by the government. Mr. Ranson has a commission as Captain Engineer Officers' Reserve Corps. He has not yet been called into the service. His business headquarters have been at Seattle.

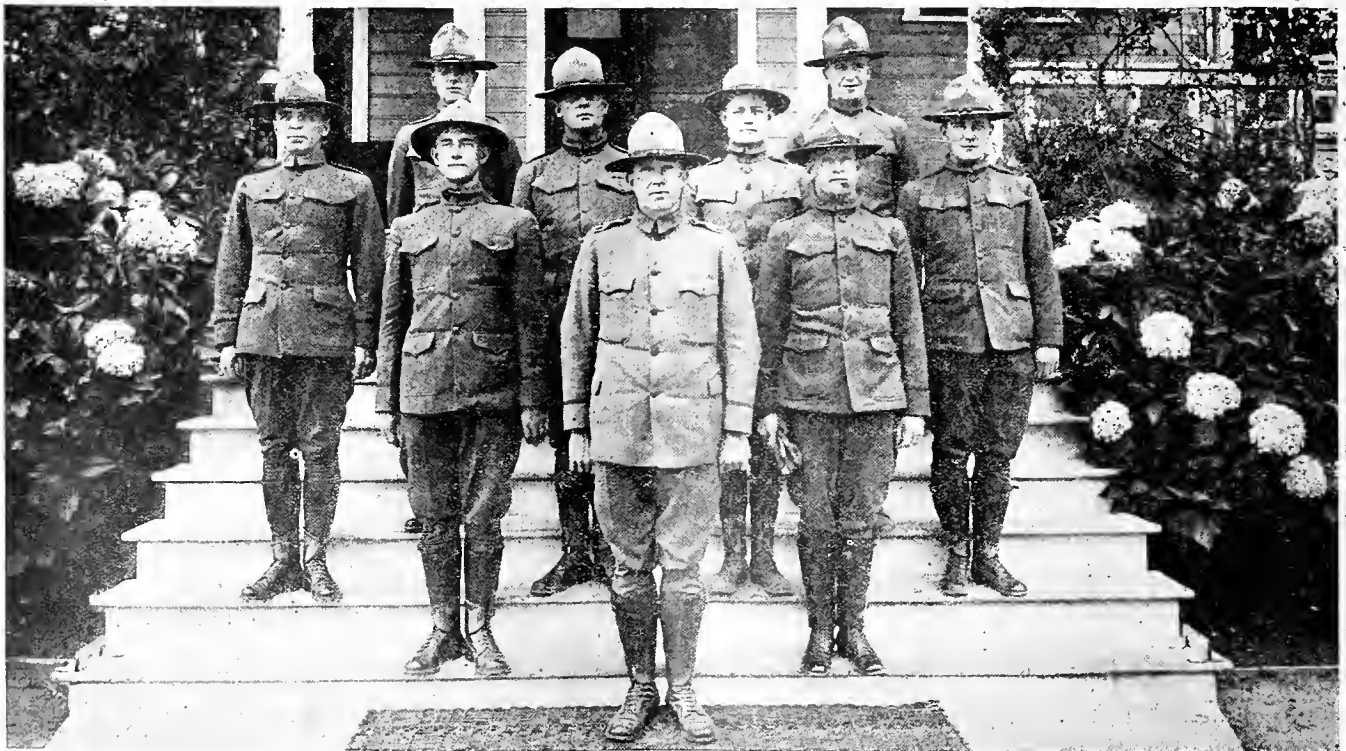
H. C. Cheek, formerly in the claims department of the Pacific Telephone & Telegraph Company at San Francisco,

has been commissioned captain in the Reserve Officers Corps of the United States Army. Mr. Cheek is a former holder of a number of coast records in athletics, especially in the hurdle races, and is a well-known figure in telephone circles.

C. A. Goodnow, vice-president of the Chicago, Milwaukee & Puget Sound Railroad, has returned to Chicago after an interesting trip through the Northwest. Mr. Goodnow reports that the electrification through the Cascade mountains on the Chicago, Milwaukee & Puget Sound Railroad is in full swing and it will be only a short time before the St. Paul's second electrified zone will be in operation.

Lincoln Hutchinson, professor of commerce at the University of California, who has aided much in former years in bettering commercial and engineering relations with our Pacific neighbors as special governmental agent to Argentine and countries of the Orient, has been called to Washington to serve with the commercial division of the National Council of Defense during the period of the war.

Harold Mestre (chairman), consulting engineer; F. L. Lowell (secretary), deputy mine inspector, Industrial Accident commission; L. D. Hopfield, department manager Natomas Company of California; C. W. Gardner, representing Hammon Engineering Company, A. L. Wilde, district representative International Brotherhood of Steam Shovel and Dredge Men; Carl Brown, manager California Casualty Indemnity Exchange; R. L. Eltringham, electrical engineer, Industrial Accident Commission; H. M. Wolfelin, mining engineer, U. S. Bureau of Mines, chief mine inspector, Industrial Accident Commission, have prepared tentative safety rules for gold dredges, and a public hearing is now in progress by the California Industrial Accident Commission to discuss all the various phases of safety devices in this industry before making the rules a permanent order.



Lieut. D. W. Scott Lieut. G. R. Rutherford Lieut. W. H. Fairbanks Lieut. A. J. Calloway Lieut. J. T. Quinn Lieut. W. H. Curran
 Capt. C. H. Moore Major A. H. Griswold Capt. W. C. Barbour

OFFICERS OF THE EIGHTH TELEGRAPH BATTALION, SIGNAL RESERVE CORPS

Here is a group of officers composed of men well-known in the electrical industry throughout the West—men who, in the service of the Pacific Telephone & Telegraph Company, have made neighbors of our great Western Empire and now offer their all that democracy may flourish and small nations have a right to live. Major A. H. Griswold, formerly plant engineer for the Pacific Telephone & Telegraph Company, is reported as doing excellent work with the hundreds of men that come under his supervision in whipping into shape the signal corps service at the Monterey Presidio. Among the amusing incidents that have recently come back to his engineer friends in civil life is the statement that in order to try out certain of his men stationed several miles distant, he recently sighted three fishing boats and flashed a query asking if they were enemy submarines. Immediately came the return flash giving the course, distance at sea, character of boats, and the reassuring statement that for the time being Monterey Bay was safe.

MEETING NOTICES FOR ELECTRICAL MEN

(September has always proven a favorite month for the holding of conventions in the West. The present season is no exception. Of especial interest to men of the electrical industry are the conventions of the Northwest Electric Light and Power Association at Spokane, the British Columbia Electrical Contractors at Vancouver, the Washington Association of Electrical Contractors and Dealers at Spokane, and the Oregon Association of Electrical Contractors and Dealers at Eugene. Details of these conventions may be found in the following lines. Other gatherings of interest to electrical men are also noted.—The Editor.)

The Northwest Electric Light & Power Association

The convention of the Northwest Electric Light & Power Association that is to meet at Spokane, September 12-15, 1917, promises to be one of unusual interest and profit to electrical men throughout the West. The complete program for this convention was published in the columns of the Journal of Electricity, June 1, 1917. Other matters of timely interest relative to this convention will be found on the first three pages of this issue of the Journal.

British Columbia Electrical Contractors

The British Columbia Electrical Contractors' Association will hold its annual convention at Vancouver, B. C., September 11 to 15. C. H. E. Williams is president of the association.

Washington Association of Electrical Contractors & Dealers

The annual convention of the Washington Association of Electrical Contractors & Dealers will be held at Spokane, September 13, 14 and 15, at which time and place the Northwest Electric Light & Power Association will also meet and a big time is promised. A number of Oregon contractors have decided to attend and an invitation is extended to all Oregon members to join the party.

San Francisco Electrical Development & Jovian League

The San Francisco Electrical Development & Jovian League will have its initial meeting of the fall season at the Palace Hotel, Sept. 5, 1917. The meeting will be brim full of interest. Tracy Bibbins of the Pacific States Electric Company will act as chairman of the day. Willis M. Deming, business manager of the Journal of Electricity, will be the speaker of the day and has chosen as the subject of his remarks a matter of vital interest to men of the industry throughout the West.

Work of the National Committee on Gas & Electric Service

The National Committee on Gas and Electric Service, one member of which is John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, has been actively co-operating with the Advisory Commission of the Council of National Defense and with a number of the departments of the government that are actively engaged in various measures for the prosecution of the war.

The committee has been able through its close touch with the gas and electric utility companies to be of special service to the Quartermaster General's Department in connection

with the troop cantonments and it has received the attached letter from Colonel I. W. Littell, expressing appreciation of its services.

Business Men Call Big Patriotic War Convention

Of interest to men in the electrical industry is the emergency call which has gone forth from the Chamber of Commerce of the United States to the business men of the country for a great war convention to be held at Atlantic

City, September 17-21. It is expected to be the largest gathering of business men ever held and will show to the world that American business recognizes its duty in this crisis and stands solidly behind the government in war. Incidentally the object of the meeting will be to encourage our Allies and strike fear into the heart of the enemy.

California Land Show

Agricultural power salesmen will be interested in attending the California Land Show this season at San Francisco. More than \$20,000 will be expended by the committees of the California Land Show for prizes for exhibits at the big exposition which will take place in October.

The awards will run the gamut from bronze medals to cash prizes and silver trophies as well as raisins, prunes, and other desirables for special days. They are offered for the purpose of stimulating state activity and for bringing California products, ranging from home made cigarettes to agricultural machinery, to the notice of the eastern as well

BUILDERS OF THE WEST—XI



W. W. BRIGGS

In the building of an empire there are many workers necessary in the perfection of the completed design. Some are called to serve in physical constructive effort, others in executive control, while still others must perform the commercial task of marketing the product of industrial effort or else the work of the builder must come to naught. In the personage of W. W. Briggs, the general agent of the Great Western Power Company, must the historian of Western accomplishment record a chapter unique in commercial success without whom the high pinnacle of success attained in clear and forceful presentation to the buyer of technical product would not today have been reached.

as the western coast.

Illuminating Engineering Society Correspondence Convention

The Illuminating Engineering Society's Correspondence Convention which this year will replace the regular annual convention will be inaugurated during September by the release of the following papers:

Presidential address, W. J. Serrill.
Report of Committee on Nomenclature and Standards, A. E. Kennelly, chairman; C. H. Sharp, secretary.
Illuminating Engineering Publicity, G. H. Stickney.
Economics of Large Building Lighting, C. L. Law and J. E. Buckley.
Illumination Intensities in Large New York Department Store, W. F. Little and J. F. Dick.

Other papers of this Correspondence Convention will be released in similar fashion during October, November and December respectively.

Oregon Association of Electrical Contractors & Dealers

Samuel Jaggar, F. C. Green, J. R. Tomlinson and J. W. Oberender are now completing plans for the annual convention

to be held at Eugene, Oregon, September 17 and 18, 1917, and with the assistance of Mr. Sigwart and Mr. Womeldorph of Eugene assurances are given that it will be the greatest convention ever held by the Oregon Association of Electrical Contractors & Dealers.

The following instructions are given concerning the convention:

Portland delegation and all persons going via Portland take Oregon Electric No. 33, limited, at 8:30 a. m., September 17. Special section for convention crowd. Arrives at Eugene at 12:25 p. m.

Luncheon at Hotel Osborne, 12:45 noon.

Convention called to order in open meeting at 2 o'clock p. m. at convention headquarters, the Eugene Chambers of Commerce rooms on West Ninth Street.

Address of welcome, J. E. Shelton, Esq., editor Eugene Guard and chairman of Publicity and Convention Bureau of Eugene Chamber of Commerce. Response, F. C. Green of Portland, Oregon, president Oregon Association of Electrical Contractors and Dealers.

Paper, "Business Methods and Outlook," by C. D. Rorer, Esq., of Eugene, president Bank of Commerce, Eugene, Oregon.

Address, "Oregon's Electrical Industry," by Franklin T. Griffith, Esq., of Portland, Ore., president Portland Railway, Light & Power Company.

Paper, "The Need of Proper Electrical Inspection and How to Organize an Electrical Inspection Department," by F. Dunlap, Esq., of Portland, Ore., chief electrical inspector, Bureau of Buildings, Portland, Oregon.

Paper, "The Electrical Jobber," by J. I. Colwell, Esq., Northwest manager Western Electric Company, of Seattle, Wash.

Three-minute discussions.

Adjournment.

7:30 p. m.—Banquet at Hotel Osborne. Music by Hendershot's Orchestra. Vocal solos by Miss Hendershot. Toastmaster, F. C. Green.

10:30 p. m.—Annual bowling contest at Abak's Alleys, 58 East Ninth street. Pacific Coast Jobbers' team vs. Oregon Electrical Contractors team. George Boring of Pacific States Electric Co., captain of Jobbers; J. H. Sroufe of NePage, McKenny Company, captain of Contractors. Pool, billiards and cards at Eugene Chamber of Commerce.

Good Morning!

Tuesday, August 18

9:30 a. m.—Annual meeting and election of officers, Oregon Association of Electrical Contractors and Dealers, at headquarters, Eugene Chamber of Commerce. Immediately after adjournment meeting of the Oregon members of National Electrical Contractors' Association and election of director and delegate to national convention at New Orleans, October, 1917.

1:15 p. m.—Take autos at Chamber of Commerce for trip "Seeing Eugene."

2:30 p. m.—Take special train for Springfield for inspection of Booth-Kelly Lumber Company's electrically equipped mill. "From water to lumber pile by electricity."

The Engineering Council of the United Engineering Society

Subsequent to the organization meeting held on June 27, 1917, the Engineering Council has held two other meetings, one on July 13 and on July 26. It has considered many matters of interest to engineers in general.

There have been appointed standing committees:

1. On Public Affairs, comprising Messrs. C. W. Baker, G. F. Swain, S. J. Jennings and E. W. Rice, Jr.

2. On Rules, comprising Messrs. J. P. Channing, Clemens Herschel, N. A. Carle and D. S. Jacobus.

3. On Finance, comprising Messrs. B. B. Thayer, I. E. Moulthrop, Calvert Townley and Alex. C. Humphreys.

Many matters coming before the Council, both from the several founder societies and from the Council's predecessor, the Joint Conference Committee of National Engineering Societies, have been considered and referred to appropriate standing committees for investigation and report.

The Engineers' Club of San Francisco

The Engineers' Club of San Francisco met at luncheon Thursday, August 16, 1917. Geo. L. Dillman, a fellow member and former officer of the U. S. Navy, spoke on the interesting subject, "The Personnel of the U. S. Navy." Mr. Dillman was a classmate of Vice Admiral Sims, now commanding the American fleet in European waters, and spoke most entertainingly regarding the reminiscences of former days at Annapolis.

The luncheons at the club are proving of excellent quality and a greatly increased attendance is very noticeable.

Semi-Annual Convention of California Development Board

Of interest to the hydroelectric fraternity of the West is the semi-annual convention of the California Development Board that is to be held in San Luis Obispo, September 7 and 8, 1917. The oil situation, now such an important one in steam electric generation, will be discussed. Other features presented by able speakers will be Farmers' Problems, Field Farming, Labor, Land Sales and Colonization, the Influence of the Chamber of Commerce in Legislation, and Vitalizing Chambers of Commerce.

A. I. E. E. Directors' Meeting

The first meeting of the board of directors of the institute for the administrative year beginning on August 1, 1917, was held at Institute headquarters, New York, on Tuesday, August 14, at 3:00 p. m.

President Rice announced the appointment in part of the committees for the administrative year. The chairman of the committees appointed are as follows: Finance, N. A. Carle, Newark, N. J.; Board of Examiners, A. S. McAllister, New York; Editing, W. I. Slichter, New York; Meetings and Papers, L. T. Robinson, Schenectady, N. Y.; Sections, Walter A. Hall, West Lynn, Mass.; Student Branches, P. H. Daggett, Chapel Hill, N. C.; Code, Farley Osgood Newark, N. J.; Standards, C. A. Adams, Cambridge, Mass.; Headquarters, N. A. Carle, Newark, N. J.; Code of Principles of Professional Conduct, George F. Sever, New York; Transmission and Distribution, L. E. Imlay, Niagara Falls, N. Y.; Lighting and Illumination, Edward P. Hyde, Cleveland, O.; Telegraphy and Telephony, L. F. Morehouse, New York; Electrochemistry and Electrometallurgy, F. A. J. Fitzgerald, Niagara Falls, N. Y.; Power Stations, Philip Torchio, New York; Marine, H. A. Hornor, Philadelphia, Pa.; Industrial and Domestic Power, E. H. Martindale, Cleveland, O.; Electrical Machinery, Alexander M. Gray, Ithaca, N. Y.; Instruments and Measurements, S. G. Rhodes, New York; Protective Devices, D. W. Roper, Chicago, Ill.; Mines, H. H. Clark, Pittsburgh, Pa.

The Patent Committee and the Committee on the Development of Water Power were not re-appointed, it being felt that the functions of these two committees now come properly within the scope of the newly organized engineering council.

Representatives were also appointed upon various joint committees and other bodies.

The program of institute meetings for the coming year was discussed. It was voted to hold the October meeting in Philadelphia on October 8, and the November meeting in New York on November 9. Final decision regarding the balance of the program was deferred until the October meeting.

LEGISLATION AFFECTING OREGON PUBLIC UTILITIES

The public policy committee for Oregon of the Northwest Electric Light & Power Association has recently submitted a very complete and interesting report on the work of the committee before the Oregon Legislature in the spring of this year. The most important legislation affecting the utilities of the State was a bill providing for a certificate of "convenience and necessity."

An inspection of the report indicates that during the 1917 Legislative Assembly there were considered just fifty resolutions, bills and proposals that affected more or less directly the activities of public utilities. Of this number, seventeen bills became law. These covered such matters as the use of streams for booming logs, the creation and maintenance of drainage districts, making it unlawful to interfere with canals and bridges, requiring public utilities and municipalities to pay interest on customers' deposits, regulating the collection and expenditure of hospital fees, and a considerable number of minor matters.

NEW BUSINESS ACTIVITIES ON THE PACIFIC COAST

New Central Station Loads

New business connected recently by the Willamette Valley division of the Oregon Power Company includes 25 h.p. in motors for a planing mill at Albany.

Tacoma and adjacent territory are benefitting largely from army activities and the construction of the cantonment on American Lake. President Dover of the Tacoma Gas Company says "The gas company is getting its share. During the past two months we have gained 250 meters and inquiries for services and appliances are greater than in several years."

The Arizona Steam Generating Company reports that construction work on its power plant at Tapco is progressing rapidly. The company expects to have steam on the plant for testing purposes about August 15th and to have the plant ready for operation September 1st. The fuel oil storage tank of 7500 barrels capacity is now being filled and the transmission line connecting the new steam plant with the Arizona Power Company's system is complete, excepting the final connecting span.

The Colorado Power Company reports that for the six months ended June 30th it has signed new power contracts aggregating 3883 h.p., an estimated annual revenue of \$114,500. The power business disconnected within the same period amounted to 1521 h.p., an annual revenue of \$52,902, leaving a net gain for the period of 2362 h.p. with an estimated annual revenue of \$61,598. As of July 15th the company had under contract not yet connected power business aggregating 2900 h.p. with an estimated annual revenue of \$99,260; this includes 660 h.p. signed up in the first fortnight of July.

Electric energy output of the Kalispell, Montana, division of the Northern Idaho & Montana Power Company during the week ended July 23, amounted to 68,000 kw.-hr., exceeding all former records of this division with the exception of Christmas week of 1916, when the output amounted to 69,000 kw.-hr. This large output is attributed to the number of electric ranges placed on the lines of the company within the last few months. It is unusual that a central station should enjoy an output in the summer even approximating that of the previous winter because of the much greater use of electricity for lighting during the dark months.

The California State Water Commission has issued a permit to the Southern California Edison Company of Los Angeles, permit under section 12 of the Water Commission Act, fixing the time for the completion of a diversion that originated prior to the time the act took effect. Amount not to exceed 600 cubic feet per second of the waters of Kern river, for power purposes. Actual construction is to begin by Sept. 1, 1917, be prosecuted with reasonable diligence and be completed by July 1, 1922. The estimated cost of completing the project, exclusive of transmission lines, is \$4,118,295. The total capacity of the plant is given as 30,000 kilowatts, the total fall to be utilized as 800 feet and the theoretical horsepower to be developed as 54,545.

The Colorado Power Company reports that in the past 30 days it has signed contracts aggregating 1000 h.p. for use in mining and milling molybdenum. This represents a new application of its service. Heretofore this rare metal has been produced in this country upon a negligible scale. It is a valuable alloy in steel manufacture, adding peculiar tempering qualities to the steel. In this connection it is of special value at the present time in the production of certain forms of armament needed in the war. While the uses of

molybdenum have been known for some time, heretofore the situation has been dominated by patents in the hands of European owners. These patents expired within the last year or so.

New Business in the Northwest

The Sperry Flour Company, Tacoma, is erecting a new stack for their Tacoma power plant.

The Cordova Power Company, A. D. McConnell, manager, is installing additional power in its property at Cordova.

The Patterson McDonald Shipbuilding Company at Seattle is placing an order for electrical equipment at Seattle.

A. H. Cox & Company have closed a contract and sent a power plant to the Kitsilana Copper Company, near Cordova, Alaska.

The Sloan Shipbuilding Company of Seattle and Olympia have purchased a 350 kw. a.c. steam plant for their new yard at Anacortes, Wash. H. L. Weber, engineer in charge.

The Hyde Coal Company, Philip Rane, manager, and Allen E. Ransom, electrical engineer is making improvements in its coal mining electric plant near Cumberland, Washington.

The Olympia Light & Power Company, S. B. Faulkner, manager, and Allen E. Ransom, electrical engineer, have their new 2000 h.p. hydroelectric outdoor substation nearly completed. Service to be renewed about October 1 or earlier.

On recommendation of Commissioner Groned, the city council of Tacoma has authorized the purchase of a 500 kw. equipment for a 4000 volt alternating current and a 600 volt direct current transformer, together with a concrete substation building at a cost of \$22,000.

Stevens & Rockwell, electrical and mechanical engineers, 955 Empire Building, Seattle, have just finished drawings for an overhead electric crane for the Sumner K. Prescott Company, local dealers in sawmill machinery. They also report considerable work in designing electrical furnaces for treatment of copper and iron ores.

New Business in California

The Pacific Coast Steel Mill in South San Francisco has dispensed with its last steam engine drive by installing an 800 h.p. Westinghouse motor drive which was formerly owned by the Davenport Cement Company at Santa Cruz.

The Pacific Gas & Electric Company has ordered a new 15,000 kw. and a new 30,000 kw. steam turbine of the General Electric design. These giant turbines are for 1918 delivery and are to be installed at Station A in San Francisco. This new 30,000 kw. unit will break all previous records for size of a single unit installed in any district west of Chicago.

An order for one 400 h.p. and one 500 h.p. motor has been placed with Allis-Chalmers for the Judson Manufacturing Company in Oakland for a rolling mill, through Romaine W. Myers, consulting electrical engineer for the latter company. The control equipment is the automatic contactor system of the Cutler-Hammer design. Esterline graphic meters will be used.

The United States Dredger Sacramento, stationed at Vallejo, Cal., has recently been equipped with the Merit System of Automatic Stoking for the saving of fuel oil, manufactured by the Westinghouse Pacific Coast Air Brake Company. The system has proven so satisfactory that the U. S. Dredger San Joaquin has been ordered by the War Department to be equipped immediately with the same system of fuel oil control.

RECENT FINANCIAL STATEMENTS

(The recent splendid showing of utility companies the country over in assisting both by their executive organization and by financial subscription the raising of the first Liberty Loan caused the public generally to watch with unusual interest the financial footing of these giant institutions. As months wear on in the great world crisis this continual survey by the public only serves to bear fruit in increased confidence in these securities. Below will be found a review of the present financial status of the Byllesby Companies which will serve to give our readers a typical example of the remarkable status of these institutions during the present world crisis.—The Editor.)

A REVIEW OF UTILITY FINANCIAL STATUS

The financial status of utilities the country over is being watched with unusual interest during the present world crisis. The splendid financial standing of these giant institutions is well attested by the ready acceptance of their securities in the great world financing that has been underway during the past three years. An excellent detail example of the nation-wide growth and financial activity of this class of security is best set forth by following in detail the earnings and prospects of the well-known Byllesby utility properties.

The Byllesby Properties a Typical Illustration

The net earnings for all utility properties under the management of H. M. Byllesby & Company for the month of June were 8.2% greater than for the corresponding month of last year, the increase being \$53,221. This compares with an increase of 6.8% in the net earnings for the year ended June 30, 1917, over corresponding previous period. Figures in detail are as follows:

Month of June	1917	1916	Increase
Gross Earnings	\$ 1,429,592	\$ 1,261,300	\$ 168,291
Net Earnings	659,198	605,999	53,221
Year ended June 30			
Gross Earnings	18,136,161	16,295,487	1,840,674
Net Earnings	8,578,574	8,028,699	549,875

That the percentage of increase for the month is greater than for the year is considered remarkable in these days of high commodity prices.

New Business Gains and Contracts.—All Byllesby electric properties show the following new business gains during the week ended July 27: 380 customers with 200 kilowatts of lighting and 828 horsepower in motors. New business contracted for but not yet connected includes 858 customers with 357 kilowatts of lighting and 805 horsepower in motors. Electric energy output for the week shows a gain of 21% over the corresponding week last year.

Byllesby Utilities Will Serve Army Cantonments.—Byllesby utility properties operate in three communities in which the Government is establishing army cantonments—Louisville, San Diego and Tacoma. At Louisville and San Diego the Government has entered into contracts with the local gas and electric companies for the purchase of electricity for lighting and power needs. The San Diego Consolidated Gas & Electric Company will furnish gas for cooking at the encampment. At Tacoma negotiations are under way for furnishing gas to the American Lake camp for both cooking and heating.

Northern States Power June Net Nearly Doubles in Four Years.—A compilation of earnings of Northern States Power Company, comparing gross and net for the months of June, and years ended June 30, shows the remarkable progress which that company has made in the past four years. A feature is the increase of 95% in net for June, 1917, over June, 1913, as compared with an increase of 86% in gross for the same period. The compilation follows:

	Month of June		Year Ended June 30	
	Gross	Net	Gross	Net
1913	\$282,788	\$141,606	\$3,893,329	\$1,975,088
1914	321,310	162,207	4,247,412	2,211,594
1915	369,879	195,285	4,765,096	2,637,670
1916	436,913	237,447	5,613,607	3,132,177
1917	527,755	276,634	6,599,517	3,498,558

Northern States Power New Business Gains.—During the year ended May 31, 1917, the Northern States Power Company increased the number of electric customers served by 19%, making a total of 85,192 now served. The increase in power business served for the same period is 18,090 horsepower, making a total of 111,838 horsepower in motors connected to the company's lines on May 31. The lighting business served by the company on the same date was 104,813 kilowatts, an increase of 6,947 kilowatts since May 31, 1916.

New power business continues to be taken on by the Minneapolis General Electric Company. Activity in the wiring of already built houses is reported, more requests for estimates being received during the week ended July 28 than during any similar period since this spring, when this class of business is most active.

Northwest Crops Represent Record Money Value.—Conditions in the Northwestern states of Minnesota, North and South Dakota, and Montana—in each of which are located one or more Byllesby utilities—are well shown in the report of money value of crops being harvested in 1917. The yields will measure up to or exceed previous high records, and because of high prices the crops will be the most valuable ever raised in these states. Eight crops, namely wheat, corn, oats, barley, rye, flax seed, potatoes and hay, reached high records of production in 1915 in which year the representative money value was more than \$618,000,000. In 1916, when the production fell below normal, the money value of these crops was approximately \$30,000,000 greater because of higher prices received. Careful estimates for 1917 indicate that the money value of these crops will be in excess of \$100,000,000 greater than ever before.

Louisville Company Shows New Business Gains.—The progress of the Louisville Gas & Electric Company is shown in the following statement of business served on June 30, as compared with one year ago:

	1917	1916	Increase
Number of Electric Customers.....	32,531	29,037	3,494
Number of Gas Customers.....	42,805	41,239	1,566
Total Customers.....	75,336	70,276	5,060
Kilowatts Lighting Business.....	35,866	32,261	3,605
Horsepower of Motors Business.....	28,040	26,219	1,821

The commercial department of the company during the week ending July 28 secured 91 new electric light and power customers with 55 kilowatts of lighting and 139 horsepower. This includes contract covering 200 kilowatts for the Army cantonment, 90 horsepower in motors additional for new elevators and 5 horsepower in motors for Friedburg Brothers. Contracts were closed for wiring 12 already built houses. New business connected to the company's lines includes 57 customers with 30 kilowatts of lighting and 290 horsepower in motors. Electric energy output for the week shows an increase of 11.2% over the corresponding week of last year. In the gas department there was a gain of 29 customers.

Fort Smith Gets New Compress.—Contract has been let for building the first unit of the Fort Smith Compress Company's new plant, to be completed in time for the storing of the present cotton crop.

Mobile Exports Double.—The Mobile Electric Company is making satisfactory new business gains. General conditions are reported good. Custom receipts for the twelve months ended June 30 are 100% greater than for the corre-

sponding previous year, the aggregate value of goods exported during the twelve months ended June 30, 1917, being \$5,000,000. This represents the highest amount of export through the port since 1905.

276 Horsepower Added by Pueblo Company.—New business connected to the lines of the Arkansas Valley Railway Light & Power Company includes an increase of 276 horsepower in motors for the cement plant at Concrete, Colo.

235 Horsepower New Power Business for Richmond.—The Richmond division of the Western States Gas & Electric Company during the week ended July 27 closed a five-year contract for light and power with a new carbon company to be located at Richmond, the first installation for which will amount to 100 horsepower in motors. Contract was also secured covering 100 horsepower in motors for Bates, Bolland & Ayres for boring a tunnel, and with the Larson Transportation Company for 35 horsepower in motors for the operation of a sand hoist.

Oregon Lumber Activities Help Oregon Power Company.—Manager A. L. Martin of the Coos Bay division of the Oregon Power Company, Marshfield, Oregon, says:

"Never in the history of Coos Bay have her industries been in such prosperous condition as at present and all indications point to marked expansion in these industries. The only thing that will hold the mills and shipyards back will be the matter of securing labor. Some of the saw mills here are offering \$3.25 per day for common labor. The additional ways being installed by the Kruse & Banks Shipbuilding plant will require about 300 additional men. They have signed contracts to build six government vessels 285 feet long. The Marshfield shipbuilding yards are being completed as fast as possible and they expect to have at least 300 men at work within the next two or three months. We have secured power contract from these people 250 horsepower in motors.

"The Buchner Lumber Company are getting ready to add a planing mill department to their sawmill and we will furnish the power for this which will amount to about 400 horsepower. The North Bend Mill and Lumber Company are also installing planers at their mill and they state that they will want 350 horsepower in motors within the next two or three months.

"Spruce lumber, of which Coos County has the largest amount of any section in the United States, is being secured as fast as it can be turned out to be used in the construction of aeroplanes. This lumber which has sold for \$20 per thousand during the past few years is now selling at a much higher price."

Gains in Utility Earnings

According to the Financial World of New York City, a number of public utility corporations reporting the operations for June and the first half of 1917 report gains. Especially is this true of the hydroelectric operating companies. The most important of these reports may be summarized as follows:

Appalachian Power Co.—Gross earnings for June, \$72,991, increase of \$8,390, or 13 per cent. Operating expenses and taxes, \$35,364, a gain of \$5,171, or 17 per cent. Net earnings, \$37,627, increase of \$3,219, or 9.4 per cent. Gross earnings for 12 months to June 30, \$849,647, increase \$126,039, or 17.5 per cent. Operating expenses and taxes, \$370,011, increase of \$44,751, or 13.7 per cent. Net earnings and other income, \$481,765, increase of \$81,922 or 20.5 per cent. The company covered all its bond interest charges, including interest on notes, and did not have to charge any interest to the construction account. The net income, after charges, was \$17,906.

Southwestern Power & Light's operating subsidiaries show gross earnings of \$343,706 in June, a gain of \$31,446, and net earnings of \$149,731, a gain of \$4,666. For 12 months gross earnings were \$4,428,514, an increase of \$457,448, or

12 per cent. Net earnings were \$2,082,122, a gain of \$241,919, or 13 per cent. Intercompany charges are eliminated in arriving at these figures.

Utah Power & Light for June, including the Western Colorado Power Company's operations, reports gross earnings of \$407,041, a gain of \$70,095, and while operating expenses increased \$38,054 to \$208,355, the net was \$198,668, a gain of \$32,041, or 19 per cent. For twelve months gross earnings were \$4,746,594, a gain of \$803,758, or 20 per cent. Operating expenses increased \$316,548, or 16 per cent, and net earnings were \$2,473,357, an increase of \$487,210, or 25 per cent. Total income was \$2,503,357 and bond interest and discounts were earned just about twice, leaving net income after charges of \$1,239,121 a gain of \$320,383, or 35 per cent. The dividend on the first preferred 7 per cent stock was earned nearly three times.

The Pacific Gas & Electric Co., of Arizona, increased its gross earnings in June \$4,395 to \$34,773, and as operating expenses increased only \$736, the net earnings and other income made a total of \$13,320, a gain of \$3,647 or 37.6 per cent. Gross for 12 months was \$426,068, a gain of 12.6 per cent, and net income after bond interest and depreciation charges was \$59,959, a gain of \$22,584, or more than 60 per cent. The preferred stock dividend was earned with a surplus of \$24,959, against a surplus for the previous 12 months of \$2,374. The operating ratio was only 63.1 for the 12 months, against 68.7 per cent.

Northern California Power Company

Setting forth excellent gains as to gross earnings, the report of the Northern California Power Company for the month of June, the first half of the present year and the year ending June 30 was published recently as follows:

Month of June—	1917.	Increase
Gross earnings	\$87,654.23	\$4,513.30
Operating expenses, maintenance and taxes	28,383.10	*568.41
Net income	\$59,271.13	\$5,081.71
Bond interest	24,941.68	5.58
Other interest	3,949.96	*688.23
Balance	\$30,379.49	\$5,764.36
Six months ended June 30—		
Gross earnings	\$415,772.70	\$6,336.34
Operating expenses, maintenance and taxes	176,253.85	9,390.99
Net income	\$239,518.85	*\$3,054.65
Bond interest	149,646.85	*19.42
Other interest	24,533.35	*3,184.72
Balance	\$65,339.65	\$149.49
Twelve months ended June 30—		
Gross earnings	\$859,697.57	\$23,952.60
Operating expenses, maintenance and taxes	355,501.96	13,308.69
Net income	\$504,195.61	\$10,643.91
Bond interest	299,295.75	*44.41
Other interest	51,452.88	*6,530.22
Balance	\$153,446.98	\$17,218.54
*Decrease.		

Western States Company Secures Large Gas Contract

Western States Gas & Electric Company has closed the largest single gas contract on the Pacific Coast, according to H. M. Byllesby & Company, engineers and managers. Upwards of four million feet of gas a month will be supplied to the Holt Manufacturing Company at Stockton, California, for the purpose of testing tractor engines, displacing petroleum distillate formerly used. Monthly consumption of gas by the Holt factory may reach ten million feet a month which would make it one of the largest consumers of manufactured gas supplied by a public utility company in the United States.

San Diego Company Saves 120,000 Barrels of Oil Annually Through Purchase of Hydro Power

According to the San Diego Sun 120,000 barrels of fuel oil will be saved annually by the San Diego Consolidated Gas & Electric Company when transmission lines are completed enabling the purchase of hydroelectric energy from the Southern California Edison Company.

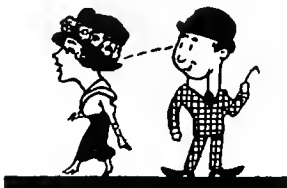
LATEST IN EVERYTHING ELECTRICAL

(Excellent work is being accomplished by The Society for Electrical Development, Inc., in offering new suggestions to the trade for the promotion of merchandising of electrical ware. Below is briefed a timely article on how to make the show window pay the rent, the original being one of the recent publications by this society. Other briefs are also set forth covering recent advances in electrical manufacture. The department closes with a comprehensive review of helpful bulletins and books for the electrical engineer.—The Editor.)

HOW TO MAKE YOUR SHOW WINDOW PAY YOUR RENT



*Harmonious Arrangement
of Color is Essential*



*An Appeal to the Eye
is Effective*



*There is an Art in Knowing
When to Stop—in Window
Trimming*

dealers in the West will do well to get a copy of the booklet.

One of the most helpful and attractive booklets of the season is that entitled "How to Make Your Show Window Pay Your Rent," just issued by The Society for Electrical Development, Inc. This book has been prepared so that "he who trims may read"; with the one prime thought of being really, practically helpful to the electrical merchant who is striving to better his store, his service, his sales.

All of the principles laid down are from practical, everyday work; not one is a mere desk theory. The Society for Electrical Development has gone to great lengths to obtain exact data on many (apparently) minor points so that it may be right in its recommendations. The big idea is to save the merchant loss of time, trouble and expense of experimenting and trying out discarded lines.

Electrical contractors and

EDISON LAMP WORKS PLAN BIG ADVERTISING CAMPAIGN

"Somewhere in California" there is situated a five-story building, the occupants of which are engaged in the more delicate task of combining glass and brass and a few particles of a precious metal. The finished product is the product that brightens our lives, helps us carry on our work or our pleasure in the night without the usual eye strain or danger, helps us protect our factories and makes travel by night possible. A few years ago there was no such factory here on the Pacific Coast and we had to be content with the Eastern product. But now right here in California 250 happy and contented real energetic workers constitute the payroll of the California factory where the most weird and intricate machines perform what the ordinary mind would think impossible. Little particles of wire—hair length and in some instances smaller in diameter are placed in glass tubes, soldered, and then placed in large glass pear-shaped globes—an all mechanical process from start to finish.

That's how California's Native Sun, the Edison Mazda lamp is made. There are so many who do not know that Edison Mazda lamps are made in California, that the Edison Lamp Works of the General Electric Company have planned an elaborate advertising campaign for all of their agents on the Pacific Coast starting Sept. 9 to 15. Special blotters, banners, posters, all featuring "California's Native Sun" have been issued.

In addition there are five special cash prizes for window displays, the first \$100; second, \$75.00; third, \$50.00; fourth, \$25.00; fifth, \$10.00. Already considerable interest is being taken by agents and it is believed that surely every one will know by September 15 that Edison Mazda lamps, "California's Native Sun" are now made in California.

A. C. OIL SWITCH FOR REVERSING SERVICE

To meet the increasing demand for an oil switch for use with small alternating-current motors which can be started by connecting them directly to the supply current, the Crocker-Wheeler Company, Ampere, N. J., has developed a moderate, priced oil switch which embodies many important features seldom found in switches of this type.

The practical design and rugged simplicity of this switch is clearly evidenced by the moving contacts which are firmly mounted on a fiber-insulated rod. These moving contacts make contact with the center row of stationary contacts and one of the outside rows of contacts when the switch is in the "forward" position and with the center row of stationary contacts and with the other outside row of contacts when the switch is in the "reverse" position. This novel switch movement gives a very large break on two points per pole.

The moving contacts are free to turn on their axis so that a new contact surface is continually presented to the fixed contacts, thereby prolonging the life of the switch. The contacts are easily removable and are of copper of liberal size.

The tank holding the oil in which the contacts are immersed is bolted to the upper part of the switch. Oil cannot splash into the wiring chamber under ordinary conditions of use.

FRAMES FOR SWITCHBOARDS

In designing switchboards for power or lighting stations, the selection of the proper type of frame for supporting the panels is of considerable importance. The size and type of switchboard naturally fix the form of frame that is most suitable.

Angle-iron frames consist of angle-iron uprights supported on a channel-iron base or wood sill and provided with flat top-irons, or ties, and the necessary corner angles. The top iron forms a continuous tie across the switchboard, provides a good alignment for the various panels, and also renders bracing each panel to the wall unnecessary. Wall braces are usually made of ¾-inch gas pipe with the necessary end connections for fastening to the frame and to the wall. The panels are bolted directly to the angle irons. This type of frame is best suited for heavy panels and large switchboards.

The chief advantage of this type of frame over any other is that each switchboard panel and its two angle uprights form a unit and may be handled as such in shipping and erecting. The panel may be completely wired by the manufacturer before shipment and the whole shipped to the customer ready for installation. Also any individual panel with its uprights may be removed from a switchboard for relocating without disturbing the connections of the panel. With

this type of frame, wiring may be run along the angle uprights instead of directly on the rear of the panel, where such an arrangement is desired.

A standard Westinghouse pipe frame for recent switchboard design consists of $\frac{3}{4}$ -inch or $1\frac{1}{4}$ -inch wrought-iron pipe uprights resting in floor flanges and provided with top-iron and the necessary top-iron brackets and panel-mounting brackets.

The application of this type of frame is limited to light panels, and small switchboards. They are especially suitable for supporting panels that do not reach to the floor, as, for instance, a 48-inch panel on a 76-inch frame, inasmuch as the pipe uprights make a neat appearance without any covering.

ATTRACTIVE CARTONS TO HELP POPULARIZE AND SELL C-H FEED-THROUGH SWITCHES

The accompanying illustration shows one of the attractive window and counter display cartons in which the new C-H 7050 Feed-Through Switches made by The Cutler-Hammer Manufacturing Company of Milwaukee, are furnished. These



New Carton with Easel Stand for Popularizing Feed-Through Switches

cartons have an easel stand and the display cover is printed in four colors. Two uses, one with an electric toaster and one with an iron are pictured in the display. The size of the box is about $5\frac{1}{2}$ in. by 10 in.

The new switch carries the standard C-H Push Button mechanism raised at 6 amperes, 125 volts; 3 amperes, 250 volts, and the characteristic indicating light and dark buttons provide the means of operation. The enclosing shell is made of C-H Thermoplax insulation material.

OUTDOOR METER-HOUSES

A most satisfactory method of installing watt-hour metering equipments for comparatively low voltages in outdoor distributing substations not large enough to warrant the expense of a substation with indoor apparatus, is to make use of a portable, weatherproof meter-house, such as the one shown in the accompanying illustration. Such meter-houses contain the watt-hour meter with calibrating and testing terminals mounted on a slate base, two current transformers, and for the higher voltages, two voltage transformers.

Standard meter-houses built by the large electrical manufacturing companies are of steel construction and designed to be mounted on pole, wall or tower. A large steel door in front gives ready access for reading or calibrating the meter.

ternal installation of the meter-house is very simple. All internal wiring from inlet to outlet bushings is completed before the equipment leaves the factory, and the only wiring necessary to put the meter in operation is to make the external connections to the power lines.

ELECTRIC CRANES FOR WAREHOUSE USE

The Century Electric Co. is just completing in St. Louis a three-story re-inforced concrete warehouse containing some nineteen thousand square feet of floor space, and located on a private railroad switch. This additional space will enable the company to conveniently handle the large amount of



The New Century Electric Warehouse, Equipped with Electric Cranes

raw material now required. The warehouse is so arranged that the heavy material such as electrical sheets, commutator copper, bars of steel, etc., can be handled by electric cranes directly from the cars into the warehouse. Smaller cranes located inside of the warehouse will handle the smaller lots for distribution to the factory.

DEAD FRONT PANEL UNITS WITH PUSH BUTTON SWITCHES

For several years the Bryant Electric Company of Bridgeport, have manufactured a line of Dead Front Distributing panels with Rotary Switches. These devices have met with universal approval of contractor and user for installation in apartment houses, hotels, residences, offices, etc. To meet the desire where push button switches are preferred, the Bryant Electric Company now offers the Dead Front Distributing Panel with Push Button Switches.

In general the construction of this line consists of a substantial porcelain base properly recessed to accommodate the standard two-button switch mechanism, of which two are provided for each unit. Provision is also made for fuse plugs for each line to the switch.

The feature of Dead Front construction is that all connections and conductors are concealed and separated from the front of the panel by a continuous sheet of insulating material; hence there can be no live parts exposed. Moreover the sheet metal front of each unit has an overhanging edge which engages with the front of the adjoining unit, thereby effectively preventing accidental contact with any live parts.

United States Civil Service Examination

The United States Civil Service Commission announces an open competitive examination for assistant electrical engineer, qualified in municipal research, for men only, on September 5, 1917. A vacancy in the Bureau of Standards, Department of Commerce, Washington, D. C., at \$1400 to \$1800 a year, and future vacancies requiring similar qualifications at these or higher or lower salaries, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

It is desired to secure eligibles with a scientific training. Some experience in experimental electrical research and in municipal problems is desirable. It is desirable that applicants have a reading knowledge of French and German, and the applicant's qualifications in this respect should be fully set forth in his application.

The United States Civil Service Commission announces open competitive examinations for heating and ventilating engineer and draftsman, electrical engineer, and mechanical

engineer, for men only. Vacancies in the office of the Supervising Architect, Treasury Department, or in other branches of the service, at the salaries indicated below or higher or lower salaries, will be filled from these examinations, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion. Heating and ventilating engineer and draftsman, \$1500 a year; electrical engineer, \$1500 to \$1600 a year; mechanical engineer, \$1600 to \$1800 a year.

REVIEW OF BOOKS AND BULLETINS FOR ENGINEERS

Of Scientific and Engineering Interest

The all-the-year-round activities of the Society for Electrical Development are pictured and described in "Aims and Achievements," a review of the society's work which has just been issued. It is a concise digest of what the society is doing. It describes in terse, simple language its endeavors to combine engineering, publicity, merchandising, advertising and field co-operation for the benefit of its membership and the entire industry.

The National Service Handbook issued by the Committee on Public Information at Washington has just made its appearance. The book contains two hundred and fifty pages and is an excellent reference for matters that have to do with the personnel of mobilizing the nation's resources in winning the war.

The subject matter of reprint 56 just issued by the heavy traction department of the Westinghouse Electric & Manufacturing Company is the article on "An Unusual Railway Electrification," by A. H. Babcock, consulting electrical engineer for the Southern Pacific Company that appeared in the Journal of Electricity for March 1, 1917. Other interesting data relative to the electrification of railways from the railroad viewpoint are also appended.

Apparatus and Equipment

The Edison Electric portable lighting outfit is described in bulletin 819 recently issued by the Edison Storage Battery Company of Orange, N. J.

The supply department of the General Electric Company has issued a collection of bulletins on wires and cables, one of which, No. 49300, "Armored Cables," was distributed some time ago. A recent appearance of bulletin No. 49302 on Wires and Cables makes the series complete.

Edison storage batteries for use in storage battery locomotives is the subject matter of bulletin No. 608 just off the press from the Edison Storage Battery Co., Orange, N. J.

Miscellaneous

The Fast Mail is the title of an interesting publication of the Ramsey, Oppenheim Co., Inc., 618 Mission street, San Francisco. The booklet tells of a new method of mail advertising that lowers the cost of distribution.

Schenectady Works News is an interesting eight-page co-operative publication that is being published in the interests of the Schenectady Works of the General Electric Company, which sets forth the life of the workers at this great industrial institution.

"Who washes your clothes?" is a pertinent question asked by the American Washing Machine Manufacturers' Association. The ten-page pamphlet is a forceful argument as to why all city and country dwellers should own their own washing machine. Handlers of electric appliances of this nature will do well to study its contents.

Outdoor Metering Outfits

The Outdoor Metering Outfits, described in bulletin No. 46251-B, which has just been issued by the General Electric Company, are admirably adapted for use in outdoor substations for measuring the amount of power supplied to the

various feeders. These outfits are compact in design and are especially built for outdoor metering service. They are offered as thoroughly reliable and accurate units. Outdoor metering outfits may be furnished for either single or poly-phase circuits to operate any usual meter combination; they consist essentially of the required meters with the necessary instrument transformer elements. The transformer elements are modifications of standard switchboard transformers thus maintaining the General Electric Company's standard of operation.

BOOK REVIEW

Audel's Easy Lessons in Wireless Telegraphy. By A. F. Collins and published by Theo. Audel & Co. of New York. Vest pocket size, 242 pages, leather binding. For sale at Technical Book Shop, San Francisco. Price \$0.50.

This booklet is a series of lessons on wireless telegraphy to fit those who desire to become practical wireless operators. It gives the elementary principles of electric and magnetic phenomena, clearly explained and well illustrated. It shows the relation of these principles to wireless transmission in such a practical way that it is a valuable aid to a rapid and complete understanding of wireless telegraphy. The cuts and explanations are clear and concise.

Electrical Machinery. By Terrell Croft. Size 6 by 8 in.; 318 pp.; 302 illustrations; cloth binding. Published by McGraw-Hill Book Co., Inc., of New York City, and for sale at the Technical Book Shop, San Francisco. Price \$2.00.

There are certain things which it is necessary and desirable for the average man to know about electrical machinery, and these essentials are stated in this book without the use of difficult mathematics. The theoretical principles and operating facts of a.c. and d.c. generators and motors with the necessary control apparatus are fully explained.

The book, written by a consulting engineer, who is the author of "American Electrician's Handbook," has to do with installation and operation, trouble location, its correction and the like. It is designed especially for the average man who is in contact with electrical machinery, and should find immediate demand in all quarters. A tabulated list of d.c. generator and motor troubles, with the remedy for each is a notable feature.

Illuminating Engineering Practice. University of Pennsylvania Lectures published by McGraw-Hill Book Co., Inc., of New York City. Size 6½ by 9 in.; 573 pp.; illustrated; cloth binding. For sale at the Technical Book Shop, San Francisco. Price \$5.00.

This book, comprising a series of lectures by a score of the foremost illumination experts of America, is an up-to-date summary of the progress made in the science of artificial lighting. After taking up the illumination units, it deals with general interior and exterior illumination characteristics. These are then treated in detail as segregated into classes of house lighting, street lighting, etc.

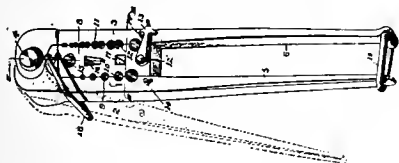
Recent developments in electric and gas lamps and the arts of ray projection and flood lighting are given in full. For the progressive illuminating engineer, this book will be of incalculable value.

WHAT WESTERN INVENTORS ARE DOING

(Electric appliances of all kinds and forms are receiving attention from the power salesman's view point throughout the West where vast hydroelectric energies are available. Below is a brief of a recent vacuum cleaning apparatus that has recently been patented by an inventor in the West, that should prove of interest. Other briefs on a lineman's tool, an apparatus for electrolytically recovering metals, a magnetic separator and a water power mechanism follow.—The Editor.)

1,233,980. Lineman's Tool. Henry E. Cator, Oakland, Cal., assignor of two-fifths to Stephen A. Byrne and one-fifth to Edward H. Moreno, Oakland, Cal.

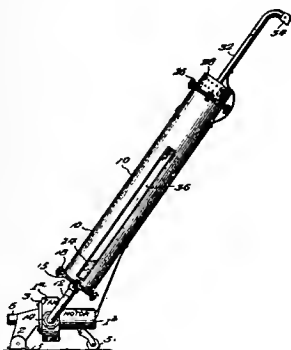
A lineman's tool consisting of a pair of jaws with handle extensions at one end, and having the opposite ends curved



toward each other and pivoted together, the inner faces having semicircular shaped recesses formed therein, an interposed member turnable upon the common pivot and having parallel outer faces recessed to meet the recesses of the outer jaws, and closable in alignment with said faces.

1,234,095. Vacuum Cleaning Apparatus. John J. Duffie, Berkeley, Cal., assignor to Vacuum Specialty Manufacturing Company, San Francisco, Cal., a Corporation of Arizona.

A pneumatic cleaner, comprising a casing adapted to move over a surface to be cleaned and having a suction-shaft carried by the frame and actuated by the belts and buckets

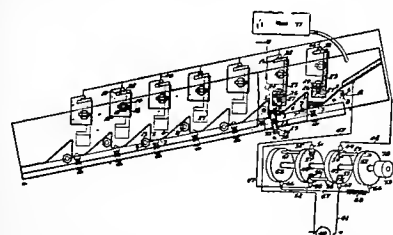


through the co-operation of the water with the buckets, the track frames, chain belts, buckets and power shaft being uniformly adjustable with the frame relatively to the base.

1,233,363. Apparatus for Electrolytically Recovering Metals.

George A. James, San Francisco, Cal., assignor, by mesne assignment of one-half to James H. Alling and one-half to Francis M. Wright, San Francisco, Cal.

An apparatus for recovering metal from metalliferous pulp comprising a series of electrolytic cells having insoluble

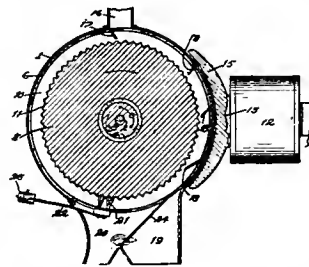


anodes, and mercury cathodes over which the pulp can flow in succession, means for feeding an electrolyte with the pulp to the first of said series, a source of supply of electricity, a rotary reverser, four poles therefor, a pair of conductors electrically connecting two of said poles with the poles of

the source of supply, a second pair of conductors electrically connecting the other two poles with opposite sides of each of said cells, said reverser being arranged once in each rotation to successively connect electrically each conductor of the first-named pair with both conductors of the second-named pair.

1,233,804. Magnetic Separator. Robert D. Pike, San Francisco, Cal.

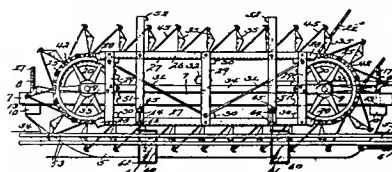
A magnetic separator comprising a stationary substantially cylindrical non-magnetic shell a pair of spaced electromagnets positioned side-by-side outside said shell and having their cores disposed radially with respect thereto; a magnetic bridge joining the outer ends of said cores; circumferentially elongated pole shoes carried by the inner ends of



said cores and lying adjacent the side of the shell; an axially disposed shaft rotatably mounted within said shell, a non-magnetic core, surrounding said shaft, a magnetic sleeve surrounding said core, and a pair of substantially cylindrical armature disks, having transversely serrated peripheral surfaces mounted upon said sleeve and positioned in transverse alignment with said pole shoes, whereby said magnet cores and their bridge, said armatures, and said sleeve form a substantially closed magnetic circuit; a non-magnetic spacer disk mounted upon said shaft between said armatures, and non-magnetic guide disks similarly mounted adjacent the outer end faces of said armatures, said spacer and guide disks being of greater diameter than said armatures means for feeding the material to be separated into said shell.

1,234,101. Water-Power Mechanism. Noah E. Royer, Empire, Cal.

In a water power mechanism, a supporting base disposable in a stream of water and movable from one point to another, a frame mounted on and supported solely by the base and provided with means for raising and lowering the same relatively to the top surface of the base, a plurality of water operated buckets connected in endless series and disposed at opposite sides of and held by the said frame, a power shaft



extending across the frame and operated by the said plurality of buckets, and guard means arranged at opposite sides of the mechanism and co-operating and adjustable with the said buckets, frame and power shaft relatively to the supporting base.

NEW ELECTRICAL DEVELOPMENTS

(The ordering of two giant steam turbines by the Pacific Gas & Electric Co. for 1918 delivery—one of 15,000 kw. and the other 30,000 kw. capacity—constitute the most interesting new electrical development as indicative of the continued industrial activity throughout the West. Other items of interest along the lines of new electrical development follow in the notations below—The Editor.)

FINANCIAL

EL CENTRO, CAL.—Bids for \$1,600,000 irrigation bonds will be received by the Board of Directors of district at Masonic Temple.

OAKDALE, CAL.—J. R. Mason & Co. announce an offering of \$50,000 Oakdale irrigation district 5 per cent bonds, due July 1, 1939, at a price to yield investors about 5.25 per cent.

SAFFORD, ARIZ.—An election was recently held at Thatcher at which time bonds in the sum of \$18,000 were voted upon for the purpose of establishing and operating an electric lighting plant in the town. The said bonds are to run for a term of 20 years.

PORT ANGELES, WASH.—Only 293 people were sufficiently interested in the proposal to issue \$30,000 worth of bonds for the electric light department of the city to cast their votes at the special election, and the majority of those were opposed to the issue.

PALO ALTO, CAL.—The council has authorized the city treasurer to purchase \$21,000 municipal gas bonds at a price of \$1.07½. The council also confirmed the sale of \$70,000 municipal gas bonds to Gervin and Miller of San Francisco, interest being 4½ per cent.

SAN FRANCISCO, CAL.—The earning statement of the San Joaquin Light & Power Company published recently shows June to have been a remarkably good earning month for the corporation. Not only did the gross earnings for the month increase \$33,413 over the total for June, 1916, but the net income showed a similar increase.

INCORPORATIONS

HARLEM, MONT.—The Citizens Electric Co. has been incorporated in this place.

SALT LAKE CITY, UTAH.—The Pioneer Oil & Gas Co. has been incorporated here with a capital stock of \$300,000 by W. H. Ritchie, L. L. Boas, Geo. R. Randall, J. H. Reilley and A. C. Cameron.

ILLUMINATION

BAKER, ORE.—The plant of the Eastern Oregon Light & Power Co. at Olive Lake, was burned a few days ago.

CHOWCHILLA, CAL.—Among the improvements to be made in Chowchilla are 29 additional street electroliers.

CHESTER, MONT.—W. L. Sawl has succeeded Clifgaard & Sawl, owners of the Electric Light Plant at this place.

VENTURA, CAL.—The board of trustees has decided to install concrete posts for the new lighting system here instead of metal.

LODI, CAL.—The town trustees have signed up for electroliers, and as soon as the money is collected the fixtures will be ordered and installed.

LOS BANOS, CAL.—Peter Knudson, who for several years conducted the West Side Garage, has bought out the H. B. Electric shop from Loyd Hoffman.

PALO ALTO, CAL.—A council committee has recommended the installation of a sidewalk and electroliers along state highway to Camp Fremont, at a cost of \$10,000.

PETALUMA, CAL.—The city engineer reported that electroliers could be placed on Kentucky street for \$1800. On a vote it was decided not to put in electroliers now.

SEATTLE, WASH.—The board of directors of Seattle School District No. 1 are receiving bids for furnishing and installing light fixtures in the new West Seattle High School.

PENDLETON, ORE.—The city council has adopted plans for the new and up-to-date lighting system for the entire city and has agreed to make a five-year contract with the Pacific Light & Power Co.

LOS ANGELES, CAL.—Notice is given that a petition has been filed in the office of the board of supervisors asking for the establishment of a highway lighting district, to be known as Walnut Park Lighting District.

PASADENA, CAL.—The City Purchasing Agent has been authorized to purchase without advertising, fuel oil, poles and insulators for the municipal lighting department, and reinforcing steel for the same department.

PENDLETON, ORE.—The town of Helix, through its town council, has signed a contract for the lighting of the city with electricity for a period of 5 years, with the Pacific Light & Power Co. A line may be run from Adams or Touchet.

GERALDINE, MONT.—The Geraldine Electric Co. has received its 18-ton engine and shortly after its installation the plant will be complete. A lighting improvement district has been created in the business section, and it is proposed to have Geraldine one of the best lighted little cities of the State.

MANTECA, CAL.—The prospects of \$25 a ton for coal the coming winter will have no terrors for the people of Manteca if the plans of P. J. Peltier are successfully carried out. Peltier is of the opinion that gas can be manufactured here as cheaply as anywhere else, and he is busy interesting local capitalists for the purpose of organizing a stock company with this idea in view.

WOODLAND, CAL.—The town of Zamora, fourteen miles north of Woodland, is to have electric lights and power soon, if the efforts of Supervisor Edson and Secretary Schaffer of the Yolo County Board of Trade are rewarded. Edson consulted with Manager Coons of the Pacific Gas & Electric Company here and he believes that the company will agree to supply Zamora with power.

SAN BERNARDINO, CAL.—A project for the municipal electric light distributing system—either purchase of one or both of the existing companies or construction of a new plant—was discussed at a recent meeting of the city council. The advisability of ordering immediate appraisal of the properties of the two companies and calling a bond election for approximately \$400,000 will be considered.

MILL VALLEY, CAL.—At a meeting of the Board of Trustees a communication was received from the Pacific Gas & Electric Co. calling attention to the advisability of arranging for an electrolier system of street lighting by laying conduits while the present street improvement is being made. The clerk was authorized to request Nelmes to appear before the board and present his system of electroliers.

OROVILLE, CAL.—Fifty thousand dollars will be spent by the Pacific Gas & Electric Company in the next few months to give Oroville one of the first gas, electric and water systems in the State. The announcement was made by J. A. Adams, who has charge of the repair work on the local gas work. To place the electric and water system of the local branch in good and efficient shape \$25,000 more will be expended in the next few months.

SACRAMENTO, CAL.—Bids as follows were opened by the City Commission for the installation of electrical fixtures in the new library building: J. C. Hobrecht, installing electric light fixtures, \$1,745 for the indirect system and \$1,517.50 for the semi-indirect system; Electrical Supply Company, semi-indirect, \$1,200; Scott, Lyman & Stack, semi-indirect, \$1,000; W. C. Dolan, semi-indirect, \$1,200. The bids were referred to the Commissioner of Public Works and the architect.

TRANSPORTATION

ONTARIO, CAL.—It has been announced that the work of closing the gap between Glendora and San Dimas will soon be started by the Pacific Electric Railway Co.

LOS ANGELES, CAL.—An ordinance has been adopted by the Board of Supervisors granting a franchise to the Pacific Electric Railway Co. to operate in the county of Los Angeles.

SANTA ANA, CAL.—The Pacific Electric Railway Co. has filed an application with the city for a franchise for its Tustin line, the matter to come before the council at its next meeting.

LONG BEACH, CAL.—The sum of \$25,000 is the initial appropriation made by the Pacific Electric railroad for track-age improvements in Long Beach, and work upon the first units of the project has been started. The improvement campaign may run to aggregate an investment of \$50,000.

TRANSMISSION

PORTLAND, ORE.—The contract for performing the electrical work in the Woodstock school was awarded to Miller & Halls for \$3011.

PORTLAND, ORE.—The Puget Sound Traction Light & Power Co. has applied for a franchise to operate for a period of 25 years in Pierce County, Washington.

MARSHFIELD, ORE.—Preparations are being made to install new machinery at the shipbuilding plant of Kruse & Banks, including a large electric crane.

VIRGINIA CITY, NEV.—The Nevada Valley Power Co. has filed a written application with the County Commissioners for a franchise to operate in Storey County, Nevada.

NEWMAN, CAL.—Sealed bids are being received at the office of W. M. Davis for furnishing and installing electric appliances for manual training at the Orestimba Union High School.

HALFWAY, ORE.—The city council has granted the Idaho Power Company of Boise a franchise to install and operate an electric light and power system in Halfway for a period of 50 years.

SPOKANE, WASH.—Bids are being received by the secretary of the Board of Control at Olympia, Wash., for two 125 h.p. boilers to be delivered and installed at the State School for Girls, at Grand Mound, Wash.

ARLINGTON, WASH.—The Washington Coast Utilities Company is preparing to install a complete meter system in Arlington for furnishing electricity for both lamps and motors. The present flat-rate system will be discarded.

PASCO, WASH.—C. S. Knowles, superintendent of construction work for the Pacific Power & Light Co. is in this city advancing the work of the new central switching station for the 66,000 volt system that will be installed here. The cost of the new plant will be about \$100,000.

TACOMA, WASH.—A franchise for the construction of a power line from the Dieringer power plant of the Puget Sound Electric Co., to Tacoma has been granted by the county commissioners. The new line will follow the Pacific Highway into the city.

BREMERTON, WASH.—The citizens of Bremerton will vote September 18 on the matter of purchasing electrical utility of the city and adjacent towns for municipal operation.

The tentative sum of \$150,000 is fixed as the maximum purchase price.

ALBANY, ORE.—The proposal to issue \$250,000 in bonds for the purchase of the electric light and power plant of the Oregon Power Company, will be submitted to the voters at a special election to be held in December or at the general election in November, 1918.

TACOMA, WASH.—The city commissioners have authorized a survey of the Mineral Lake power site. The city is considering the purchase of the power site with a view of developing the same as an auxiliary to the Nisqually plant. The proposed development would cost about \$500,000.

IDAHO FALLS, IDAHO.—The Utah Power & Light Company is reconstructing three 225 k.v.a. units in its local plant. Work will soon begin on the erection of a 11,000 volt electric transmission line (10 miles long) to serve electricity for domestic and irrigation purposes in the Fairview district.

CHOWCHILLA, CAL.—Manager Paul Wilson, of Madera district, for the San Joaquin Light & Power Co., has affirmed the report that a power station for the Chowchilla district is to be built here. The station to be built here, to make it possible to operate the enlarged system, is estimated to cost \$35,000.

SAN DIEGO, CAL.—The city council has granted permission to the San Diego Consolidated Gas & Electric Co. to cross city property in the Mission Valley with a transmission line. It is stated that the company intends to construct a tower on either side of the valley and one in the center which are to carry the wires.

LOS ANGELES, CAL.—It was announced at a meeting of the Public Service Commission that final options have just been secured on property on both sides of the Los Angeles River where the Franklin Canyon siphon crosses this stream, and which property is desired for an auxiliary electric power plant of 4000 h.p. capacity.

TACOMA, WASH.—An ordinance has been passed by the city council appropriating the sum of \$22,000 for the purchase of 500 kw. converting machinery equipment for the conversion of 4,000 volt alternating current to 600 volt direct current for use on the Tide Flats car line and bridges and the erection of a station building.

PORTLAND, ORE.—Work has been begun on the construction of a dam on the edge of Bull Run Lake to determine the possibility of storing water at the lake. It is proposed to increase the depth of the lake, thereby increasing the city water storage. The increase in the amount of water also may be a part of a municipal lighting plant project.

LOS ANGELES, CAL.—The Board of Public Service Commission is receiving sealed bids at the office, Room 1002 Knickerbocker Building, for 10,000 ton ampere, 10,000 15 ampere, 5000 twenty ampere, 5000 twenty-five ampere and 5000 thirty ampere, Edison Base Brass-cap Plug Fuses, with mica window, for 125 volt circuits.

SEATTLE, WASH.—The finance and city utility committees of the City Council are considering engaging J. L. Stannard of Portland, Ore., consulting engineer, to prepare an estimate and report of the power possibilities of Cedar River, between the existing power plant at Cedar Falls and the water-works intake at Landsburg.

ASTORIA, ORE.—The contract for furnishing 13 electric motors, having approximately 600 h.p., for the port docks, was recently awarded by the Port of Astoria commission to the Westinghouse Electric Company, whose bid was \$60 under that of Fairbanks, Morse & Co. The new motors will cost the port the sum of \$7,693.10, and will be delivered here some time between October 1 and November 1.

TACOMA, WASH.—The city of Seattle has taken a 60-day option on the Lake Cushman power site, the purchase of which has been under consideration by the City Council at

various times. The option taken puts the city under no obligation to purchase and requires no deposit. The site is owned by the Mason County Power Company and is valued at \$400,000. The cost of development for a plant similar to the one at La Grand, with a 45-mile transmission line, is estimated at \$3,000,000.

NORTHPORT, WASH.—The Northport Power & Light Company, recently organized with a capital stock of \$200,000, to install an electric light and power system in Northport, will purchase energy from the West Kootenai Power & Light Company of Rossland, B. C., connecting with its transmission lines at the boundary. The line will be erected from Bonnington Falls to Northport, a distance of 30 miles. The Northport power company will supply energy to the Northport Smelting & Refining Company. The Northport smelter, it is understood, will be operated by electricity instead of steam power. The cost of the electric system is estimated at from \$125,000 to \$150,000.

TELEPHONE

MOGOLLON, NEW MEXICO.—A fire at Mogollon did damage to the extent of \$20,000. Moose hall was destroyed, together with the telephone exchange, which was located in the same building.

LOS ANGELES, CAL.—C. F. Mason, superintendent of the Southern California Telephone Co. has announced that an additional sum of \$175,770 has been set aside by the directors for hydroelectric work of unifying the systems.

CAMP CODY, CAL.—The Mountain States Telephone & Telegraph Co. is arranging to have two switchboards installed at Camp Cody to take care of the business of the camp. Trunk lines will also be connected with the main office in the town.

SAN LEANDRO, CAL.—The Pacific Telephone & Telegraph Co. has offered the city of San Leandro \$100 for renewal of its franchise for right to operate a telephone and telegraph system in this place. Final action was deferred for once in order that the company might see that the proceedings are regulated.

OAKLAND, CAL.—Following a meeting in the office of Mayor Davie in Oakland a few days ago, attended by members of the Oakland City Council and Manager W. R. Alberger of the Oakland Traction Company, announcement was made by Alberger that the street improvements required of the Traction Company would be started soon. According to Alberger, the company has on hand 154 tons of steel rails for the improvement of College avenue within the city limits, to cost \$175,000, and the improvement of the lines on Telegraph avenue as far as Fortieth street, at a cost of \$126,000.

IRRIGATION

EL CENTRO, CAL.—The Imperial-Laguna Water Company will lose no time in getting busy on a project for an all-American canal and the new survey will begin in August, it is stated. It is probable that the Imperial Irrigation District will become a participant in this survey.

TACOMA, WASH.—A survey of the Mineral Lake power site will be made by the city as a result of action taken by the city commissioners. Commissioner Gronen of the light and water department proposes to purchase this site, with the idea of development of an auxiliary water supply for the Misqually plant.

WOODLAND, CAL.—Plans are not yet finally settled upon call for the irrigation of 12,000 acres of land in the northern part of the county, that is now devoted to dry farming only. It is proposed, if the tests show the scheme feasible,

to install several pumping plants. The electric company, too, will be asked to install power.

FRESNO, CAL.—Upon testimony of E. E. Slater, J. R. Ostlen and Pearl Hart as to the number of signatures of land owners on the petition for the creation of the Tranquility Irrigation District the supervisors approved the petition, and it will now go to Sacramento. Some new land will be placed under irrigation in the district, and it is the plan to take over canals and laterals that are now in existence.

HAYFORK, CAL.—A farm loan association has been formed here. Fifteen members have taken \$35,000 worth of stock. The association covers the eastern part of Trinity County—Hayfork Valley, Lewiston, Hyampom and Douglas City—William S. Ross is president and L. B. F. Jenkins is secretary. The association joined in asking the State Engineering Department to send an engineer to investigate the feasibility of making an irrigation district that will include 12,000 acres in Hayfork Valley.

KLAMATH FALLS, ORE.—The Pine Grove Irrigation district was established by the county court of Klamath by unanimous vote. The new district comprises approximately 1500 acres in the Pine Grove section seven miles east of the city and is being served with water from the Government canal by means of a pumping plant. An election will be held to vote upon the matter Sept. 4. The new pumping plant has already been installed and the water put on the land to irrigate this season's crops.

SAN DIEGO, CAL.—Plans for development of two big water systems in this county and the building of a large power plant to furnish power for San Diego County and Imperial Valley have been announced. Incorporation papers have been filed for Warner Mutual Water Co., incorporated for \$6,000,000 and the Pamo Mutual Water Co. for \$4,750,000. Incorporators and directors of both companies are Wm. G. Henshaw, Col. Edward Fletcher, W. E. Hodges, E. O. Faulkner and Wm. B. Gross.

PLACERVILLE, CAL.—In efforts to complete certain parts of the million-dollar power project before winter sets in, the Western States Gas and Electric Co. will increase its force of 40 men to 120 at once. The company expects to complete the concrete work on the dam, 1000 feet long, at Twin Lakes this fall, and place the earth next summer. Between 50 and 60 men will be added to the crew of 20 hands now working at Twin Lakes. It is planned to build four small masonry dams on the Medley Lake, or Desolation Valley unit, this season. The dam at Echo Lake, which went out a few weeks ago, has been reinforced and the flume repaired, assuring a normal supply of water this year. There will be no work done on the great Echo Lake tunnel this season.

BAKERSFIELD, CAL.—Outlining the demands of a \$30,000,000 project, whereby storage waters of Kern River and its tributaries will be utilized for irrigation and power development to redeem a half-million acres of now arid land, the water committee of the Kern County farm bureau has submitted its report here. The report divided the work into two phases—the conservation of the flood waters and the drainage of from 90,000 to 100,000 acres of waterlogged land which the investigation said had reached that stage through seepage from existing irrigation systems, and in some cases through excessive irrigation. There are from 600,000 to 800,000 acres in the Kern River drainage basin available to irrigation and the run-off from the Kern River and its tributaries is approximately 994,000 acre feet. The report recommended the organization of a water users' association, which will sponsor the project in which State and Federal aid will be solicited.

JOURNAL OF ELECTRICITY

VOL. XXXIX NO. 6 SAN FRANCISCO, SEPTEMBER 15, 1917 PER COPY, 25 CENTS

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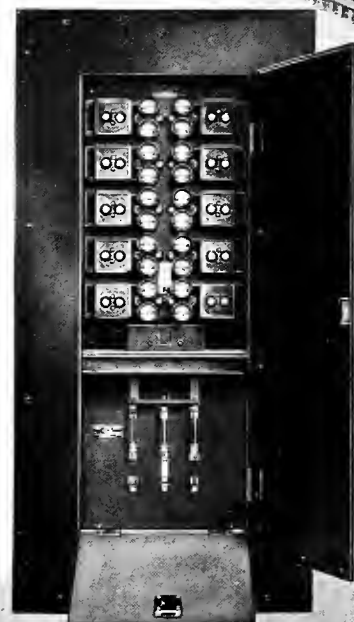
Further than this, Benjamin Protective Lighting Equipment offers a practical solution for the problems of all manufacturers, who have these conditions to contend with.

Let our Illuminating Engineers advise with you. Their services are invaluable.

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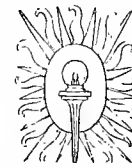
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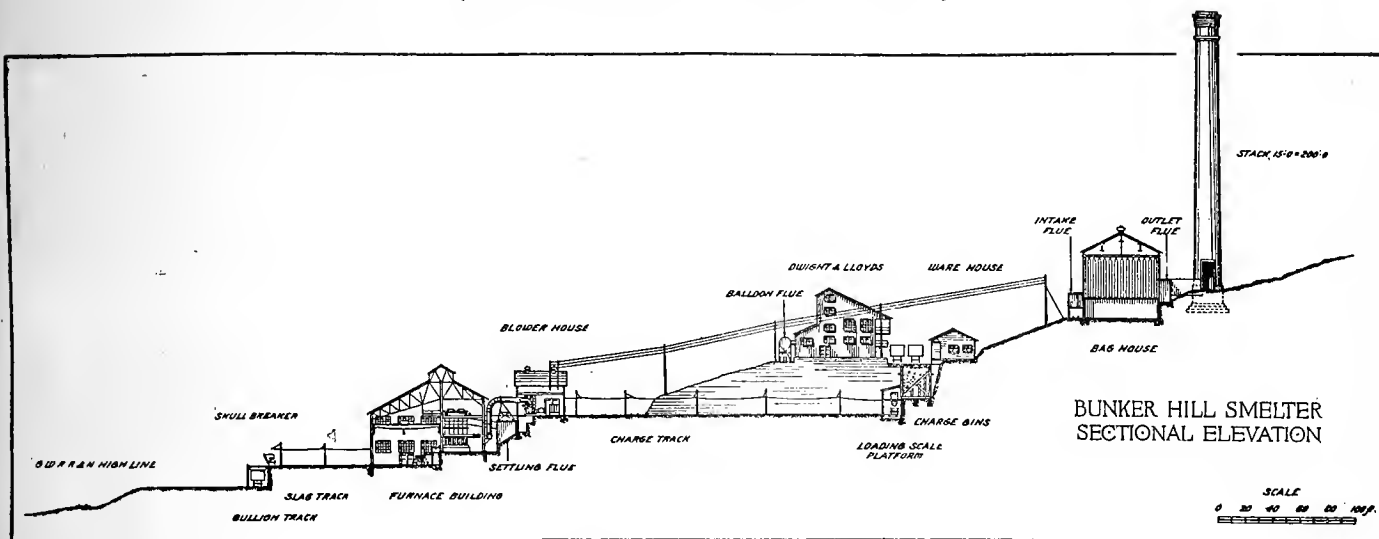
Devoted to the Generation, Distribution and Utilization of Energy

VOLUME XXXIX

SAN FRANCISCO, SEPTEMBER 15, 1917

NUMBER 6

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Sectional Elevation of Bunker Hill Smelter

ELECTRICITY AT THE BUNKER HILL & SULLIVAN

BY A. H. HALLORAN

(The Bunker Hill and Sullivan mine, mill and new smelter at Kellogg, Idaho, is an excellent illustration of the application of electric power to mining in general and the metallurgy of lead in particular. As electricity is fast becoming indispensable in the mining industry, it behooves electrical men to understand the various metal mining processes. Furthermore, as the Bunker Hill installation is to be the objective of the Northwest Electric Light & Power Association's contention excursion in September a description of the properties seems at once timely and instructive.—The Editor.)



Receiving Outdoor Substation

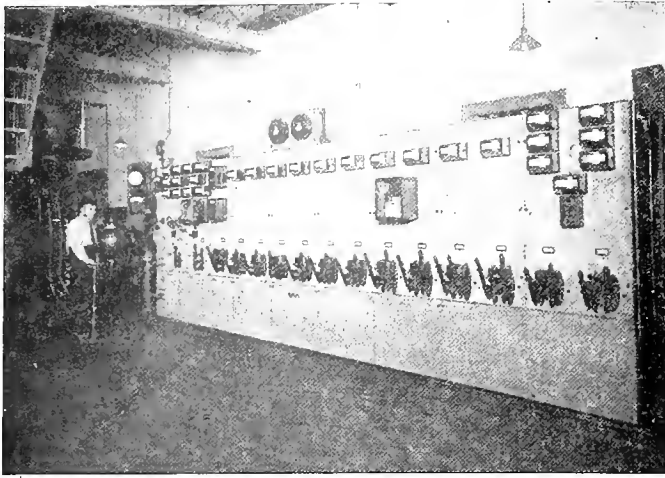
ably infrequent. A turbine is also being installed at the smelter. Either of these turbines can be started and

ELECTRIC power for the operation of the entire plant is purchased from the Washington Water Power Company, whose 60,000 volt transmission lines from Spokane serve the Bunker Hill substation where seven 650 k.v.a. transformers step the current down to 2300 volts for distribution over the local lines. The mining company has installed a 750 h.p. steam turbine driving a 2300 volt generator as a standby for possible interruptions to the hydro-electric service, which, by the way, have been remarkably

carry the main load within seven minutes after power is shut off.

In the mine, electric power is used for hoisting, traction and pumping. The mine is reached through the Kellogg tunnel, whose outlet is near the mill and whose face cuts the shaft at the 9th level, two miles distant. Here an electric hoist brings the ore from the various lower levels and dumps it into bins, whence it is drawn into cars for haulage by 500 volt trolley locomotives to the mill. From the main Bunker Hill shaft the Kellogg tunnel and trolley system also radiates 4500 ft. to the Sierra Nevada Cons. shaft and 4500 ft. to the Caledonia shaft.

Direct current for operating the trolley system is carried on No. 00 copper wire as far as the Bunker Hill shaft and on No. 0 copper to the other two shafts. Alternating current for the pumps, hoist, storage battery motor-generating sets, shaft and station lighting, and air-preheaters in compressed air hoist, is transmitted at 2300 volts over two circuits, a No. 2 B. & S. triple conductor, varnished cable incased in a lead sheath and a



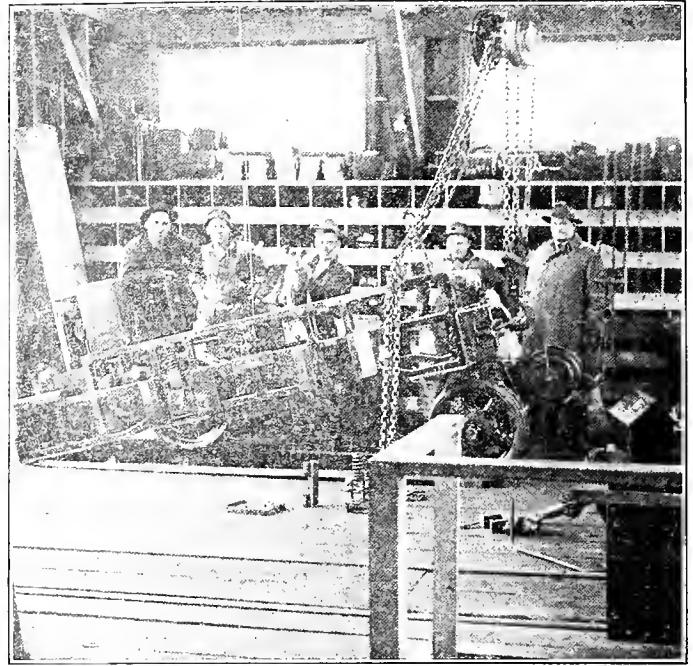
A.C. Switchboard in Mill Substation

No. 000 leaded varnished cambric cable covered with jute. Both cables are kept in continuous service.

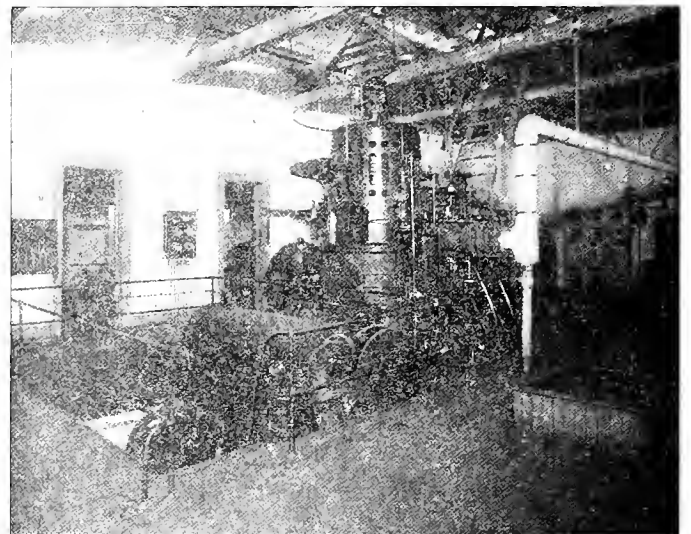
The ore is assembled at shaft pockets from the stopes on the 11th, 12th, 13th and 14th levels by storage battery locomotives and on the 10th level by a trolley locomotive, retained because of the small and decreasing tonnage handled. A storage battery locomotive is to be installed at the new 15th level as soon as it has been sufficiently developed. These several levels are at 200 ft. vertical intervals. On the 11th level is a $2\frac{1}{2}$ ton Jeffrey locomotive, on the 12th a $3\frac{1}{2}$ ton Westinghouse, on the 13th a 4 ton General Electric, and on the 14th a $4\frac{1}{2}$ ton Westinghouse. The battery equipment is as follows:

- $2\frac{1}{2}$ ton Jeffrey—63 cells, type "A 8" Edison—Capacity 150 ampere hours.
- $3\frac{1}{2}$ ton Westinghouse—70 cells, type "A 8" Edison—Capacity 300 ampere hours.
- 4 ton General Electric—70 cells, type "A 8" Edison—Capacity 300 ampere hours.
- $4\frac{1}{2}$ ton Westinghouse—66 cells, type "A 8" Edison—Capacity 300 ampere hours.

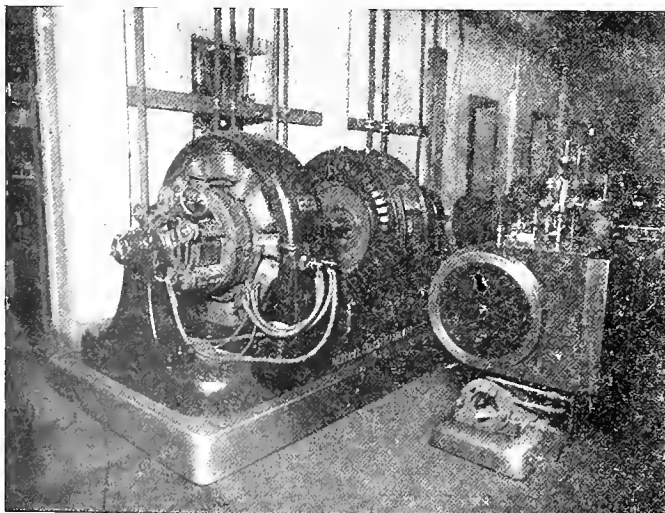
Charging stations at all levels are supplied from a 50 h.p. motor-generator on the 13th level receiving 2200 volt current from the a.c. three-phase line and delivering 125 volt d.c. A wattmeter on the a.c. side records kilowatt hours consumed. Overload circuit breakers and reverse current relay protect the motor-generator set from



Storage Battery Locomotive for Underground Use



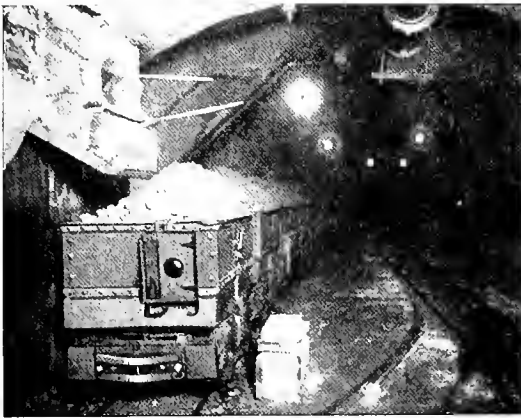
Emergency 750 kw. Curtis Steam Turbine



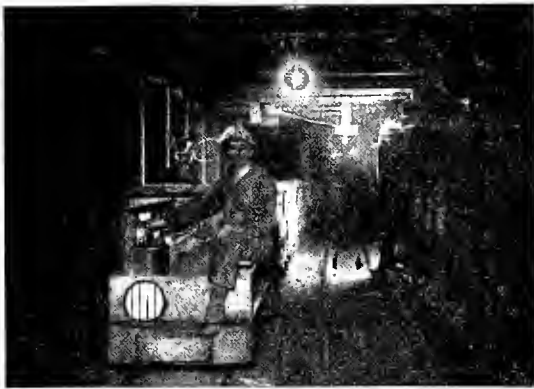
Motor Generator Set Furnishing 500 Volt Direct Current for Locomotives in Tunnel



Seven 650 k.v.a. 60,000/2300 Volt Transformers in Mill Substation



Loading Ore Cars in Mines



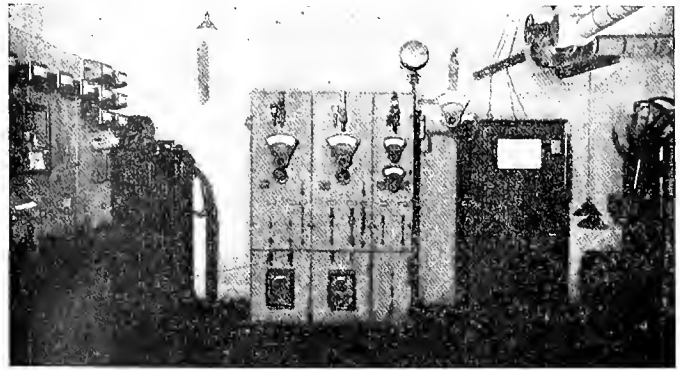
Underground Charging of Storage Battery Locomotives



Trolley Locomotives and Train of Ore Cars



Tunnel Lighting



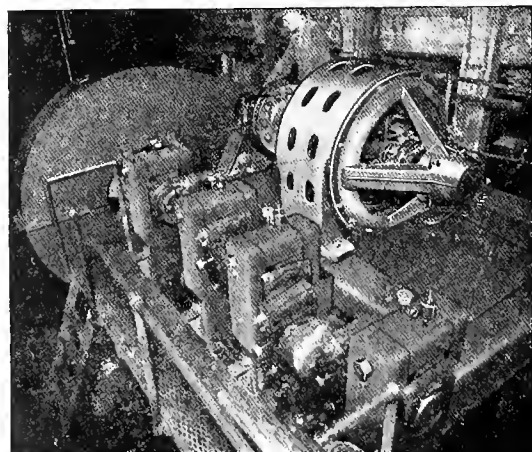
D.C. Substation at Mill

overload and possible reversal of current due to low voltage or service interruption. Each charging station is equipped with regulating rheostats so as to vary the charging rate as needed.

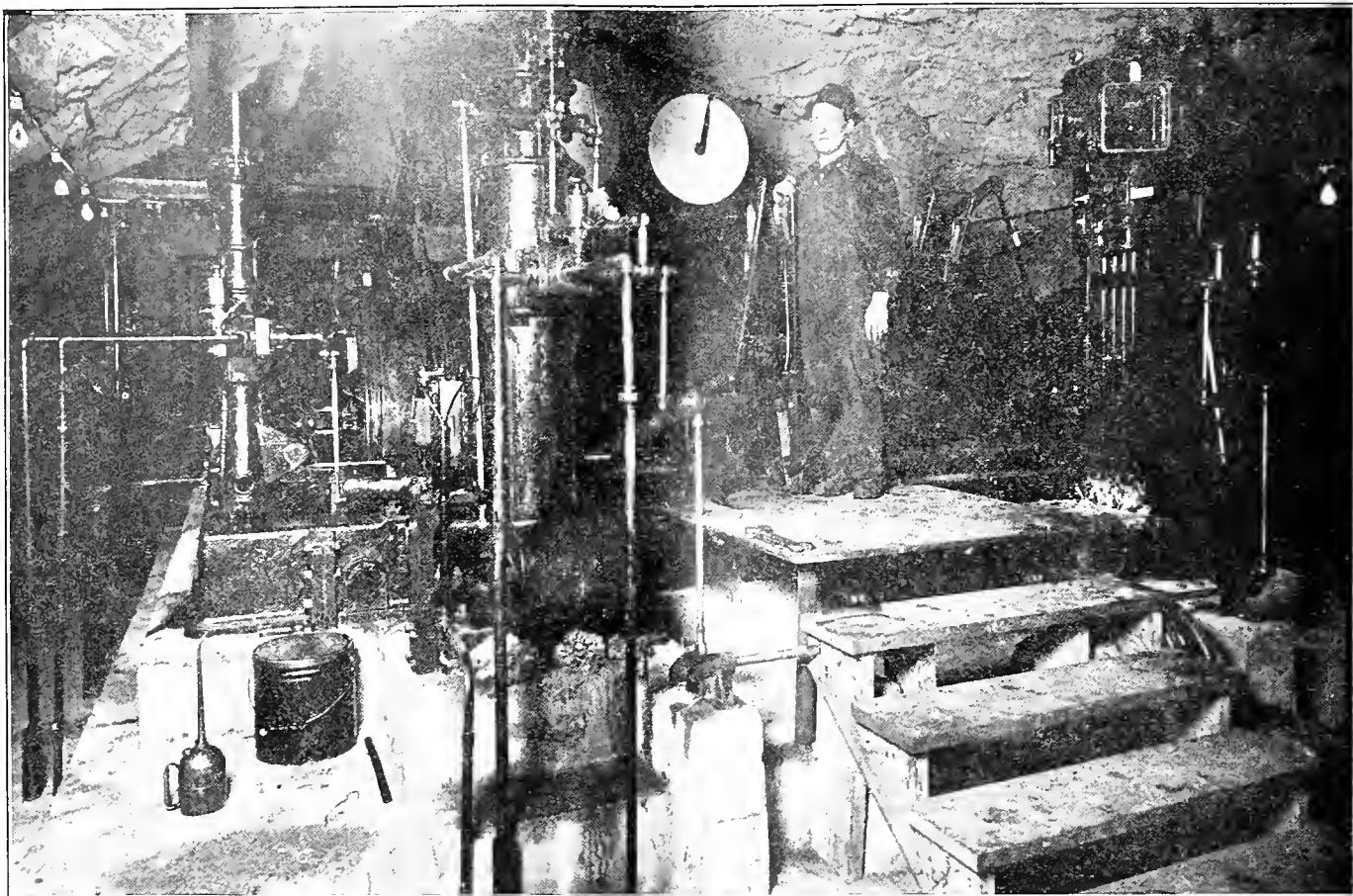
The Jeffrey locomotive is equipped with two sets of batteries, one being charged while the other is in use. The other locomotives, starting with full charge, are operated from 8 a.m. till noon, when they are given a 30 minute charge. After four hours further operation they are given a two hour charge which suffices for an eight hour operation, after which they are given a five hour charge and then stand idle for 30 minutes, thus completing the 24 hour cycle.

Each locomotive handles an average of eight 3 ton cars per train over an average distance of 1000 ft. The current consumption averages 0.2474 kw.-hr. per ton of ore hauled, which figure also includes the handling of an unknown tonnage of waste. It is estimated that storage battery operation costs 75 per cent less than trolley locomotives doing the same work. Distilled water for the batteries is brought into the mine daily in 5 gal. canvas water bags.

The ore is hoisted to the Kellogg tunnel by a double drum hoist driven by an induction motor with automatic acceleration provided by a Cutler-Hammer switchboard controller of the multiple solenoid type. The engineer merely throws his controller to the running position to start the hoist, the amount of current and acceleration being controlled by the board through a series of contactors controlled by series relays. A chart record in the power house gives a complete history of all hoisting



150 h.p., 2300 Volt Motor Driving Quintriplex Motor on 13th Level



Underground Electric Hoist

operations. During 1916 there were 416,689 tons of ore hoisted at a cost of \$22,751.84, as follows:

	Total for the year	Average per ton
Wages of hoist men and ship men.....	12,104.00	.029
Lubricants	315.11	.001
Timber and lagging	12.22	....
Miscellaneous	4,595.45	.011
Machine shop repairs	1,857.87	.004
Electrical repairs	697.15	.002
Electric power	3,094.84	.007
Electric light	75.20	....
	<u>\$22,751.84</u>	<u>.047</u>

Water is pumped from the shaft at an average daily rate of nearly 600,000 gal. by five motor-driven pumps aggregating 535 h.p., the motors being three-phase, 2200 volt. A General Electric curve drawing ammeter in each circuit records the time of starting and stopping and the amount of power consumed. The pumping costs for 1916 were \$15,356.24 as follows:

	Total for the year	Average per ton hoisted
Wages of pumpmen.....	\$4,859.50	.012
Lubricants	77.79	....
Miscellaneous supplies	896.41	.002
Machine shop repairs	1,452.25	.003
Electrical repairs	412.72	.001
Electric power	1,657.57	.019
	<u>\$15,356.24</u>	<u>.037</u>

Minor electrical equipment in the mine includes lighting the tunnel, shaft and stations, a complete underground telephone system equipped with an auxiliary 110 volt circuit operating Russell signal horns, and a block signal system manually operated. All hoist bells, with auxiliary lamp flashers and all telephone signals, are operated at 110 volts, a.c. An electric "safety first" sign is installed in the tunnel.

Air for the rock drills is furnished at 100 lb. pressure by two compressors in the power house, one a 3300 cu. ft. Nordberg, driven by a steam engine on one end and a 500 h.p. turbine water wheel on the other, and the other



Underground Telephone



Electric "Safety First" Sign in Tunnel



400 h.p., 2200 Volt Induction Motor Driving 2400 cu. ft. Ingersoll-Rand Air Compressor

a 2400 cu. ft. Ingersoll Rand driven by a 400 h.p. induction motor.

The ore is trammed from the shaft to the mill through the Kellogg tunnel by 500 volt trolley locomotives in 17 car trains, each car having a capacity of $3\frac{3}{4}$ tons. Eighteen of these are in service for hauling ore, timbers, men, mine supplies and fuel for the power plant.

The crushing and concentration of the ore represents the largest single factor in the use of electric power.

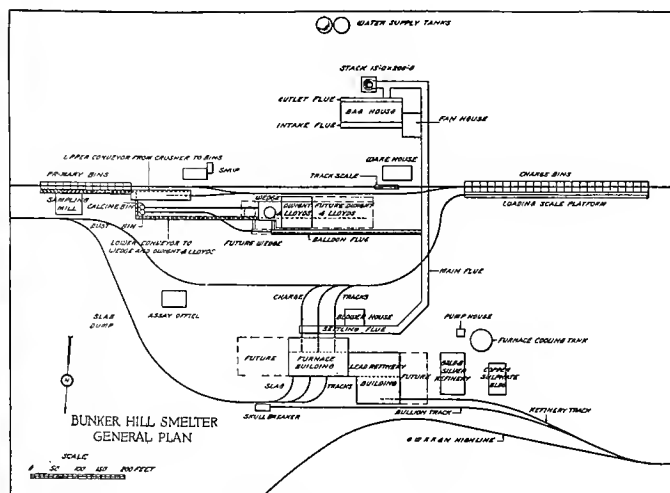


Ore Cars at Dumping Bin

the 33 motors in the rock house and two mills constituting a connected load of 1897 h.p. The treatment includes crushing, coarse concentrating, fine concentrating and flotation.

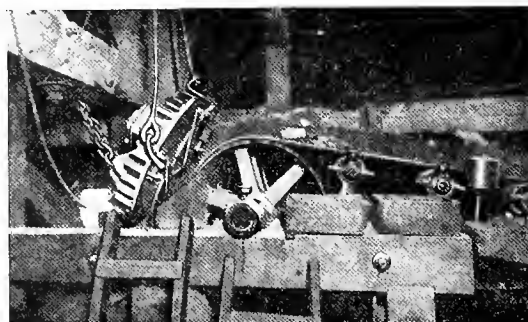
The ore cars are dumped into a 1400 ton storage bin whence a belt conveyor carries it to No. 5 bronze ball crushers. Over the belt conveyor at the grizzly entrance to the crusher is a 36 in., 250 volt electromagnet which picks out any iron or steel that may be mixed with the ore. This not only prevents damage to the crushers and rolls, but also saves tools which have been lost in the mine.

From the ball mills the ore passes through trommels to a Symons disc crusher, whence it passes through another set of trommels to a 1700 ton ore bin. As the two concentrating mills, West No. 1 and West No. 2, are nearly identical, the accompanying flow sheet of the latter will suffice to trace the treatment. The vanner and table floors in the coarse concentrating section are driven by a 250 h.p. motor and the jigs and rolls by a 200 h.p. motor.



General Plan for Smelter

Briefly described, the process consists in the separation of the coarse concentrates by 7 Harz jigs, the re-grinding of middlings in rolls and mills so as to pass a 20 mesh screen for fine concentration together with the slimes from the jigs. The values in this material are extracted by Card tables and Frue vanners, the slimes passing to flotation cells, where after mixture with oil and agitation with air the froth is floated off, the surplus water removed in a Dorr thickener and an Oliver filter press and the concentrates collected in bins whence they are hauled in cars to the smelter.

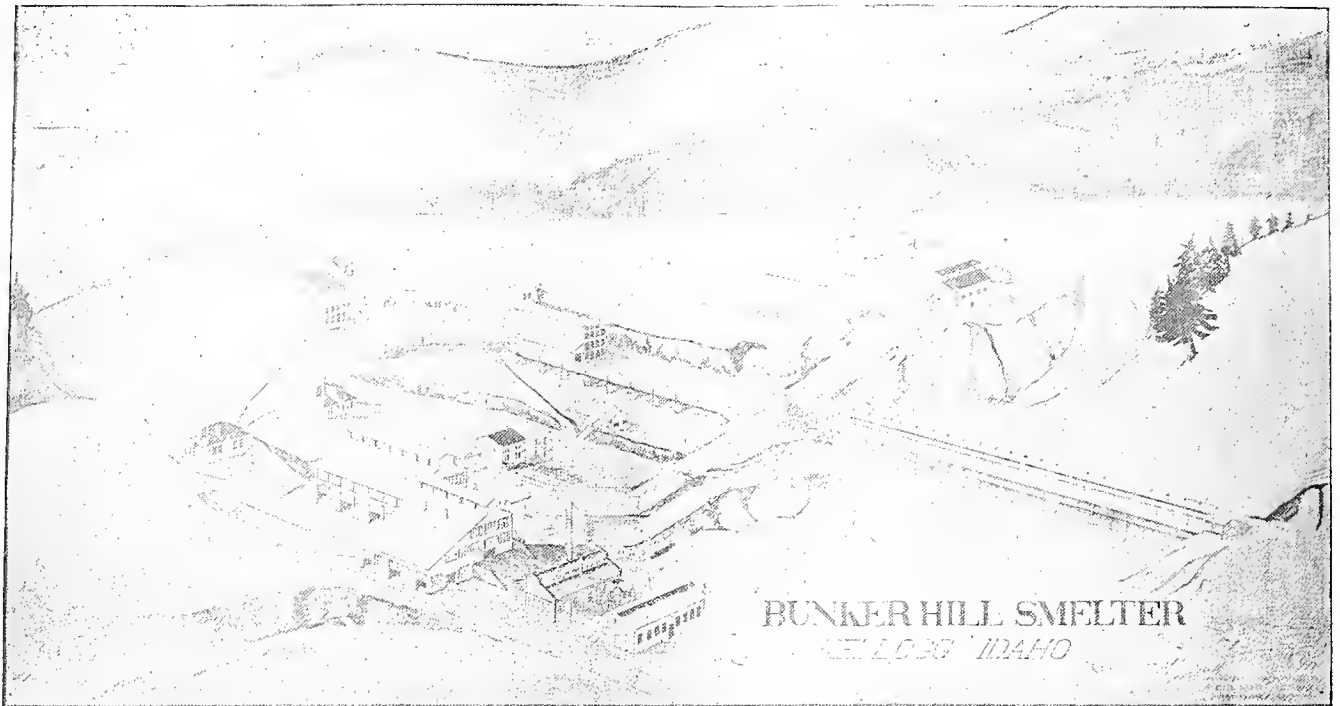


Electro-Magnetic Extractor of Iron in Ore



250 h.p. Induction Motor Operating Table and Vanner Floor

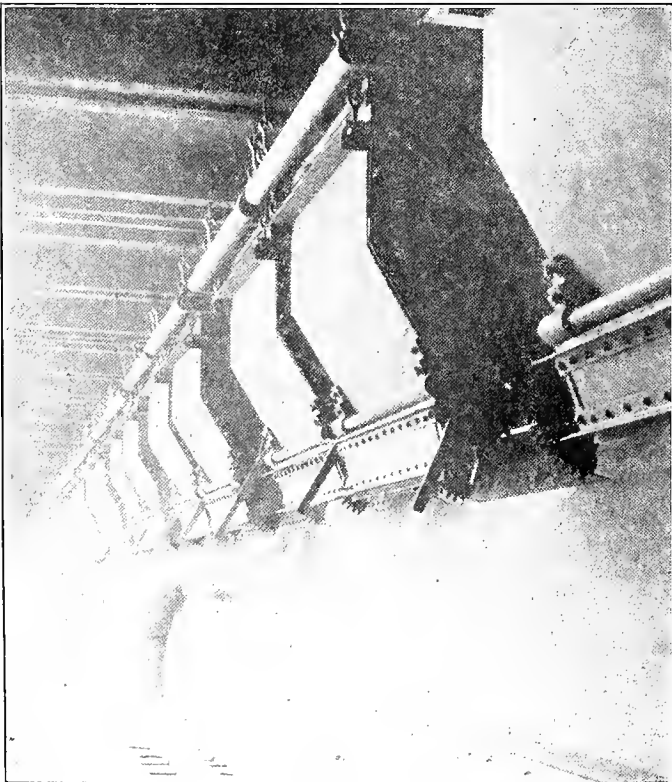
The new Bunker Hill smelter, as blown in during August, 1917, is designed to treat not only the concentrates from the Bunker Hill & Sullivan mines, but also other lead-silver mines in the district. It comprises a complete equipment for sampling, roasting, sintering, smelting and refining gold, silver and lead ores. An electrolytic zinc plant is also to be installed in the near



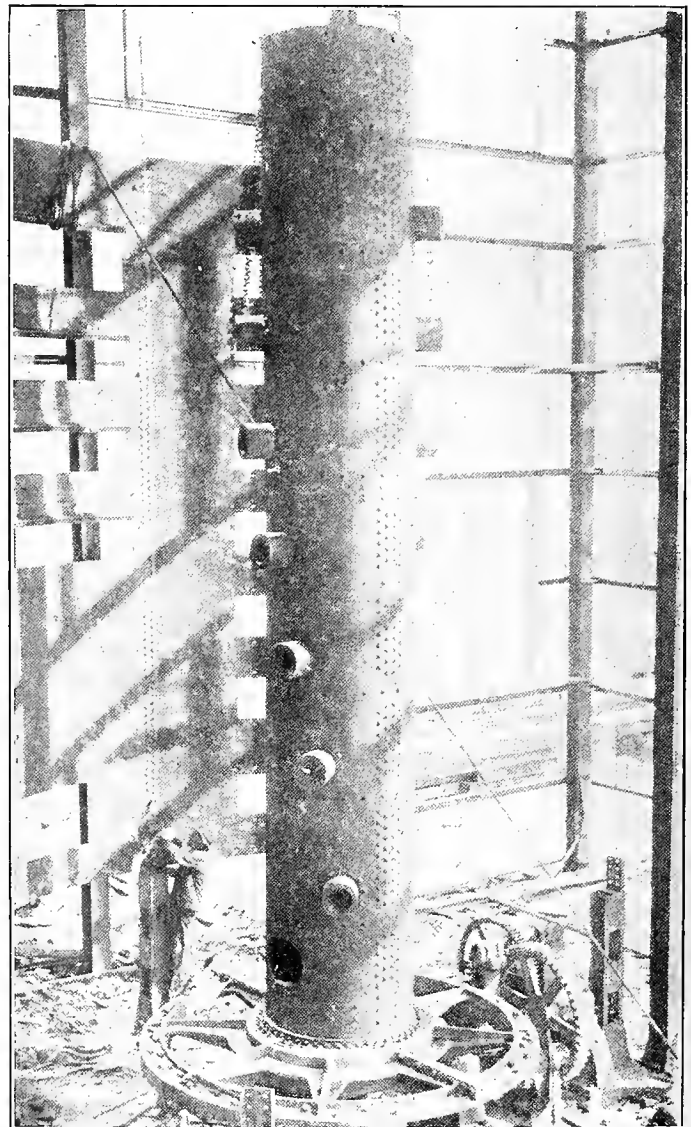
New Bunker Hill Smelter

future. The 30 acre site is less than a mile to the west of the mill, with which it is connected by a standard gauge railroad which delivers the ore and concentrates to concrete receiving bins.

From the receiving bins belt conveyors remove the ore to a crusher and sampler having a daily capacity of 1200 tons of ore. Here a 75 h.p., 2200 volt motor drives a 10x20 in. Blake crusher, two sets of 36x14 in. rolls, a 48x72 in. trommel and four Vezin samplers. Four 5 h.p., 440 volt motors operate the conveyor system which then distributes the ore to any one of eight storage bins, each



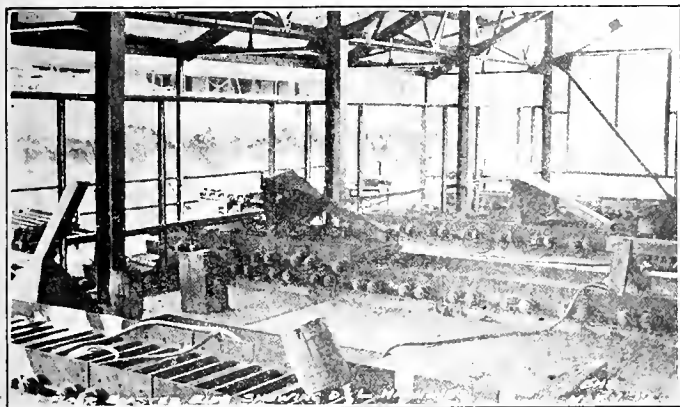
Scale Hoppers



Erection of Wedge Roasting Furnace

equipped with two apron-belt feeders delivering the ore to a belt conveyor going to the roaster building.

Here a multiple deck 26 ft. Wedge roasting furnace with a capacity of 50 tons per day gives a preliminary roast to lead matte or other material carrying a high percentage of sulphur. This furnace consists essentially of a cylindrical shell surrounding a series of compartments staggered one above the other so that the ore drops from one to the other as it is raked by a series of



Dwight & Lloyd Sintering Machine

arms actuated by a central shaft revolved by a 5 h.p. motor. Fuel oil and the sulphur in the ore furnish sufficient heat to remove most of the sulphur. As the gases carry off some values in the form of flue dust a Cottrell electrostatic precipitation system is installed to catch the dust from the Wedge furnace as well as the sintering machines.

The roasted material from the Wedge furnace, together with concentrates carrying a lower sulphur content, are delivered by belt conveyors to storage hoppers which feed four Dwight & Lloyd Desulphurizing and sintering machines. By means of these machines a thin sheet of intense flame impinges directly upon a thin bed of ore as it is carried forward on an endless steel belt, motor driven. This belt is perforated so that the hot gases are drawn through the ore by large exhaust fans which thus remove the sulphur as sulphur dioxide and sinters the ore into a compact mass. Each steel belt is driven by an induction motor and each exhaust fan by a 50 h.p., 2200 volt motor.

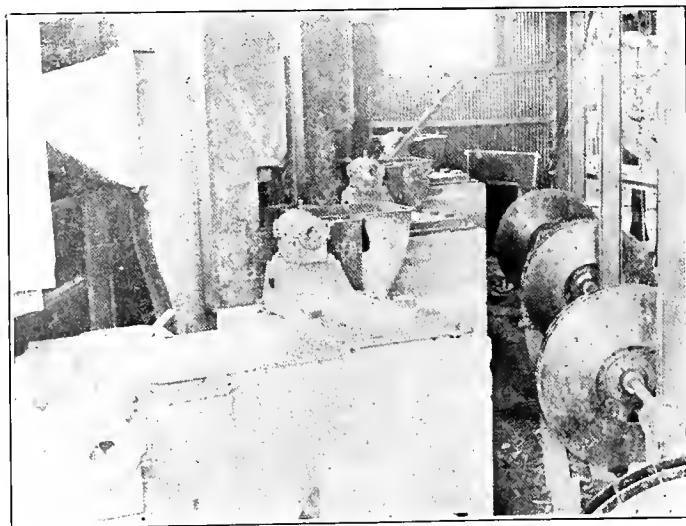
The roasted sinter is carried in hopper bottom steel cars to eight 3400 ton reinforced concrete storage bins. An equal number of timber bins of the same capacity hold both the coke and the limestone, crude ore, slag, by-products, etc., which are used in making up the charge for the blast furnace. Each bin is equipped with two arc gates and 4 ton hopper scales, where the material is weighed and delivered in bedded layers to hopper bottom charge cars that discharge directly into the blast furnaces, being hauled by 4 ton trolley locomotives.

The blast furnaces are three in number, each 42 by 180 in. at the tuyeres, with an estimated capacity of 200 tons of ore per day. Each furnace has twenty 4 in. tuyeres through which air is blown at 15 lb. pressure by motor driven compressors in the power house. After the slag has been drawn off into steel pot cars handled by an electric locomotive, the bullion is delivered to lead pots which are carried by a 20 ton, 4 motor electric crane to the dressing and refining department.

Here the antimony, arsenic and copper are recovered from the bullion in two 80 ton softening furnaces, the bullion then passing to four 50 ton desilverizing kettles. Zinc is now added so that the gold and silver will unite with it as a dross which is skimmed off for further treatment. The lead, in turn, passes to two 80 ton refining furnaces and thence to four 50 ton merchant kettles, whence it is removed in molten form by four centrifugal pumps which deliver it to the casting machine. This machine, the invention of John F. Miller, consists essentially of a water cooled drum whose outer surface carries a series of moulds. Fitting tightly over the upper portion of the drum is a metal jacket fitted with a discharge pipe from the lead pumps. As the drum is revolved by an induction motor, the moulds are successively filled, the lead pigs dropping onto a truck beneath for delivery to freight cars.

In the silver refinery the zinc is first retorted off from the dross in eight Faber du Faur furnaces and the residue treated in two cupelling furnaces where the lead is removed as an oxide, leaving the gold and silver as dore metal. With the addition of sulphuric acid the silver is removed as silver sulphide and the gold left as a residue, which is cast into bricks in a crucible furnace. The silver is siphoned into the lead-lined tanks, copper added to form copper sulphate and precipitate cement silver, which is washed and melted for casting into bars. The copper sulphate solution is evaporated and bluestone recovered.

The gases from the Wedge roasting furnace and the Dwight & Lloyd machines pass through 400 ft. of steel balloon flue to Cottrell precipitation tubes having a capacity of 60,000 cu. ft. of gas per minute. From here, these gases, together with those from the blast furnaces, pass through a bag house to collect the fumes. This is a



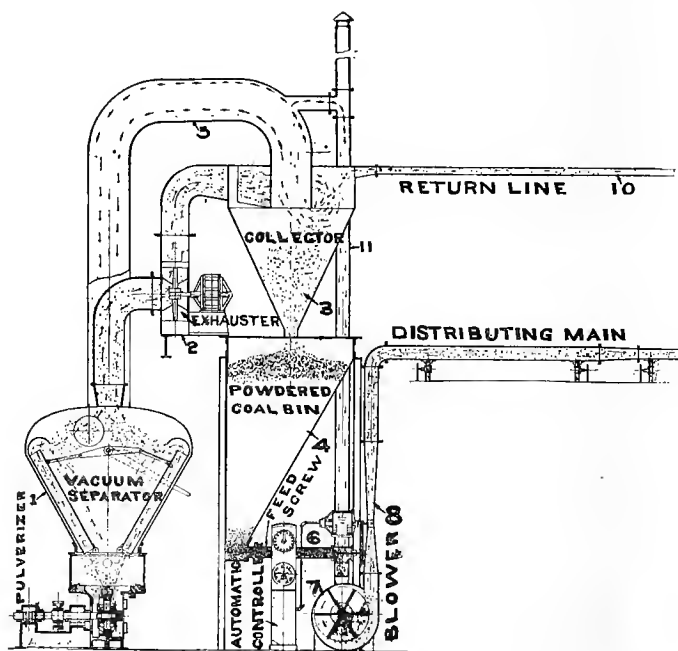
Assembly of Fans for D. & L. Machines

concrete-steel building, 56 by 100 ft., divided into three chambers, each containing 400 bags. Beneath these bags is a thimble floor through which the dust is dropped into twelve cells from which it is removed from time to time. A centrifugal fan having a capacity of 60,000 cu. ft. of air per minute and driven by a 75 h.p. motor forces the fumes through the bag house. A similar fan is held in reserve. All the gases are finally delivered to a Custodis brick chimney, 15 ft. internal diameter and 200 ft. high.

In the smelter power house two Ingersoll-Rand turbo-blowers, each with a capacity of 12,000 cu. ft. of free air per minute, furnish air at 48 oz. pressure to the blast furnace tuyeres. Each blower is geared to a 200 h.p. General Electric induction motor. There are also two 75 kw. motor-generator sets supplying direct current to the trolley locomotives and electric cranes.

The smelter was designed to use fuel oil in the roasting, sintering and blast furnaces. But recent advances in oil prices have necessitated the installation of a coal pulverizing plant which will supply powdered coal in lieu of fuel oil. This is accomplished by means of the Holbeck system, manufactured by The Bonnot Company of Canton, Ohio.

By this system slack coal is drawn from storage bins and automatically fed to a pulverizer where it is ground to dust. As may be seen in the accompanying drawing, the action of the pulverizer throws the dust into a vacuum separator, whence the finest particles are drawn into the exhauster (2) and the coarse fall back



Coal Pulverizing System

into the pulverizer. From the exhauster the powdered coal is blown to the collector (3), where the expansion of the air permits the suspended particles to fall into the powdered coal bin (4). The air is carried through the return pipe (5) back to the pulverizer.

A feed screw (6) delivers the dust to the suction side of a high pressure blower (7), whence it is blown into the distributing main and carried to the furnaces. The coal which is not used in the furnaces passes through the return line (10) to the collector and powdered coal bin, the excess air passing to the suction side of the blower through pipe (11).

In conclusion, the writer wishes to express his indebtedness to Walter C. Clark, electrical engineer, Bunker Hill & Sullivan Mining Company, and M. J. Bottinelli, his assistant, for information furnished and courtesies extended.

A NEW RECORD FOR POWER TRANSMISSION

For many years engineers of the West have prided themselves in the world beating engineering feat at Carquinez Straits in California, where the Pacific Gas & Electric Company transmits a portion of its great hydroelectric energy from its water power plants in the high Sierras by means of four steel cables with a 4427 ft. span of wire.

According to the Journal of the Royal Society of Arts this record is soon to be outdistanced in Canada. The rapid increase in power demand in the province of Quebec during the last year or two, due to the manufacture of munitions of war and other materials not formerly produced in Canada, has impelled the Shawinigan Water & Power Company to undertake a record-breaking engineering feat—the spanning of the St. Lawrence River with a 100,000 volt transmission line, furnishing power and light to various towns. The construction of this transmission line entails the erection of two towers, which will support a 5000 ft. span of three steel cables. This span is the longest of the kind known, says the Journal of the Royal Society of Arts, exceeding the 4427 ft. span across the Carquinez Straits in California.

Towers will be necessary rising to the unusual height of 350 ft., the same elevation as the top of the Quebec Bridge. The height of the towers is fixed by the requirement of river navigation, the lowest point in the cable having to clear the water by 160 ft. minimum. The towers rest on concrete foundations located in the river about 500 ft. from each shore. These foundations consist of four circular concrete columns 11 ft. in diameter, extending to a depth of 40 ft. below the river bed and projecting 25 ft. above it, thus being partly submerged.

At the top the towers widen out into a platform, on which are mounted the supports for the three cables, which are to be of plow steel. These cable supports are all on the same elevation and placed in such a position as to keep the cables 50 ft. apart, to prevent them from swinging together in the long span. The cables are not anchored at the supports, but are brought down on the back of the towers to an anchor in the ground at some distance behind the towers. The supports, however, are designed to allow a certain amount of movement to the cables, due to the expansion caused by changes in temperature.

In order to use the cables as conductors to carry current at 100,000 volts, it will be necessary to insert special insulators in them between the ground and the supports on the towers. The magnitude of this problem is better understood when it is realized that these insulators are not only subjected to extreme electric tension, but also to a mechanical stress of above 150,000 pounds each. The arrangement of insulators must allow the replacement of any parts that may become damaged through electric failure without interfering with the mechanical safety of the span. The insulator group will consist of an elaborate arrangement of porcelain units of a new type subjected to pressure only, and held together by an iron frame. It is hoped to have the whole project completed by the end of the summer.

SOME APHORISMS OF THE TRADE

BY J. C. RALSTON

(Pithy statements of a general truth, in a language that men of the electrical industry can understand, are of great value in instilling enthusiasm and forwarding the industry as a whole to a higher plane of usefulness. Here are some aphorisms that should readily appeal to men of the electrical industry in the West. The author is a consulting engineer of Spokane and has prepared this paper for presentation at the Spokane convention of the Northwest Electric Light and Power Association, September 12-15, 1917.—The Editor.)

Observation, imagination and technique are the three phase delta connections that lead to heaven. They are the mystic trinity in the electrification of humanity, lacking which the science, the business and the trade must incessantly lag; possessing which your activities may speed to the ultimate terminal. Combine them, and you distill the sparkling wine of success; dissociate them, and you compound the gall of failure; omit them, and you de-energize your supremest talents.

Their combination, in the midst of these martial days, has made, with rare vision, this convention an inspiring reality.

It is impossible to conceive a permanent success in light and power in which any one of these three principles is wholly absent. Observation without imagination merely confirms the obvious; imagination without observation evaporates into nonsense, while both of them devoid of technique condense into moonlight mist. Finally, that which makes for your industry's greatest attainments is when the three are connected in series, proportional in energy, periodicity and performance.

If one were speaking of the historical development of light and power, one might say that these three doctrines correspond in sequence to the infancy, adolescence and maturity of the industry. In infancy, from Franklin's kite-string to the long-distance circuit, the observation of outstanding phenomena dazzled even the wondering eyes of the wise men. In adolescence, imagination, bridled, on the one hand, with the conservative hopes of genius, led to the unfolding of the dynamic mysteries of electricity; and, on the other, untrammelled by the rules of reason, led, through the medium of profane literature, into the weird, uncertain and extravagant fields of popular expectation. The third period, now surely opening, reveals this industry of the Magi—this supernal enchantment—of which you gentlemen are the high priests, standing on the golden threshold of virile, resourceful and promising maturity.

But philosophic history always diverts us into the fields of comparative speculation—the calibrating of past achievement,—too-often pedantic, too seldom-empiric. Perhaps, then, our theme, like the heavenly muse, should suggest the inspiration of immediate accomplishment, or the power of ambition, or the futility of a handicap in the hands of high resolve, or the laudable purpose of achieving not the greatest thing in our work but the best.

Thus, observation leads us to ask, What's in a name? Well, so powerful, so subtle, so tragic is this question that we find history has recorded but a single instance of a child being named Judas Iscariot. A name may be a nonentity, like a forgotten grave. It

may be a millstone suspended by the cords of tradition to the neck of foolish immolation; or it may be an irreplaceable jewel, the gift of mortal time and man's devotion to service.

The public service corporation which through a lack of imagination has gained a reputation for aloofness, has thereby hung a millstone on the neck of its stockholders. If, like a Shylock, it has mercilessly demanded its pound of flesh, it has failed in the observation of those outfield conditions which lead to the boneyard. If, through the absence of technique, it has given an unwilling, inadequate and desultory service, a certificate of necessity will haunt its morbid dreams.

All plans are not made on a drafting board. A well defined purpose, carefully drawn to scale, and fitting into the needs of your company, makes a beautiful drawing. Blue print it, and keep a copy on your desk and one at home. It will keep you from being empty-hearted.

Because you demand 100 cents on the dollar in your pay check is the honorable and imperative reason why you should give 60 minutes on the hour in the personal or company services which you sell. This is the exciter bus of honesty.

Check your opinions by your actions. Such a course will cure more bad politics, more poor judgment and more visionary projects than all the rules of psychology. It is a sort of synchronizer, and keeps one in step with effective methods.

No patience is tolerable with the man who sighs that he has been denied the opportunity of education. That's the slacker's groan. The power of ambition can chisel a perfect model from the most adamant human granite. This is equally true in the midst of our most exacting employments. Under the inspiration of this very power we achieve the best within us. It is the e.m.f. of panting ambition, and this is what your company and your customer pays for.

A grouch in the commercial office is like a stray current, one never knows where it may do damage; but a smile is like a static arrester, it chokes the bile out of a customer's kicks. The grouch is a liability, always depressing the balance sheet; the smile is an asset that swells the dividends. Cultivate the habit of smiling, then convert the habit into a gift.

The chief who always atrophies his assistants by austerity, who wears a Medusa on his shield, is the man that usually freezes up his customers. Take the resistance coils out of his gizzard. But the genial, sympathetic and whole-hearted chap who can keep abreast of his current technical literature, who knows why the other chap is succeeding, who is always qualifying for the place ahead, whose keen observation,

live'y imagination and finished technique are invariably kept at hot-spot temperature, is the one who imparts a fly-wheel effect to the entire staff.

The company that administers its policies of public intimacy at long distance is like a blind traveler,—sure of nothing so much as pitfalls. If every management had always applied the single-phase system of consideration to both the stockholder and the customer, instead of an alternating two phase method, doubtless the dividend graph would show fewer depressions. Your customer must profit if your company would profit. This is the law of simple harmonic motion.

All public service agencies are of necessity concerned with politics, because politics concerns itself with such agencies. This is an inescapable, but sometimes poorly visioned, corollary. Mutual and friendly concern are often displaced with mutual and cordial distrust, forced upon us by vested authority and accepted by invested prudence. Worse still, the politicians have dug themselves in, and have woven their theories of Industrial Democracy into a maze of threatening entanglements. Thus interests which would willingly acknowledge rational regulation are driven to accept in addition an irrational overlordship which, unhappily, is at once petulant and paradoxical.

Being full of knowledge, knowing not only the intricacies of your business, its history, its philosophy and its economics, as well as its relation to the scheme of public welfare, you are the ones to translate its significance, its purpose and its necessities into public interpretation. The necessities of the public are the law, and you are the true prophets thereof.

False prophets there are a-plenty, in office and out, and a goodly number of stuffed ones besides. Workers they are by day and toilers by night, with a full load factor and no limit on over-heating. They are ever ready to throw their theoried monkey wrench into the gears of commerce. Put a safety guard over your gears by becoming more active men of affairs and by identifying your leisure moments with public well-being.

Your interests are the media which state legislatures and federal bureaus so often use for the culture of socialistic experiments in their visions of an industrial Utopia. Business men generally and public utility officials particularly might well take a more active interest, openly and frankly, in politics. It is an honorable privilege as well as a civic duty. They should know their political candidates as well as they know their foremen. These federal and state agencies combine to form an active anode, as it were. The apathetic public is always the inert but chargeable cathode, while the resultant electrolytic deposit is the supertax of strangulation and the price of senseless indifference.

Your combined observation should surely give wings to a prophetic and clear-visioned imagination that must discern a depressing future unless, with the technique of your masterful minds, you divert these threatening schisms back into the orthodoxy of governmental encouragement. The proposed encroachments of the Bureau of Standards, for instance, are outstanding questions whereof imagination needs no lotus compound to conjure up the Fool's Paradise into

which, if submissive, you may be led. But it is sure that under a firm resolve, with patience and perception, with team work and a common policy, the genius of your intelligence will prove these handicaps to be of no avail. "Doing easily what others find difficult is talent; doing what is impossible for talent is genius"

All lines of organized activity at times have to face the unexpected, have to solve strange and peculiar problems, meet climatic emergencies, and repair all sorts of broken circuits. Sometimes these surges are political, frequently they are financial, often they are technical; relatively they are unexpected, but sequentially they are deliberate. Therefore, the man of imagination is the one who can anticipate a crisis,—he gets there first.

Today the government is sending its trade commissions and special commercial agents across the seven seas in quest of information and reports,—a laudable policy, to be sure; but let us ask why does not Industry demand laws by which business may combine, as in other nations? It could then send out its own agents, not to make findings and reports, but to bring home orders. Every power company should be politically and certainly is commercially concerned. Industries not Utilities hold the golden fleece. Continuing industrial contracts make corporation finance read like the stories of mythology,—triumphant gods and demi-gods.

It might be profitable to know what reactance effect there would be on the growing pains of public utility concerns if their securities were popularized through small denominations and were made legal media for investment by savings banks. Liberty bonds have given the whole people their first vision. Your industry might well and shrewdly have more partners among the common people. It would expand the sales department and put hundreds of good-will agents in the field. The small, omni-present politician and the restless public hate nothing so much as that which they believe to be a close corporation. There is a destructive imagination—delete it. Yours must be a constructive one—consecrate it.

The country has seen the railroads legislated into white corpuscles. The average man looks on with equanimity, if not with I. W. W. glee, at every failure of the roads to secure equitable rates; and yet every proper advance in rates is a commentary on the prosperity of the people. Uniform prosperity is national prosperity. On the other hand, bankruptcy in any arm of fundamental industry affects unfavorably every other arm, and always points to general insolvency. Federal control, public ownership and other socialistic nostrums are the capital of merely cheap professors and self-seeking bureaucrats.

What has happened to one may happen to another. The experience of the railroads points a moral and adorns a tragic tale. It is a threat in the cumulus clouds of the western sky. It bodes an evil hour for you and yours. Mobilize, then, your varied and commanding talent, your splendid and brilliant genius, which serves in all your ranks, and, shoulder to shoulder, with characteristic determination, destroy the pernicious spirit of political witchcraft.

HIGH LIGHTS IN CENTRAL STATION SALESMANSHIP

BY L. A. McARTHUR

(Successful selling of electrical devices is a subject of permanent interest to Pacific Coast power companies. The same general principles apply whether the sale is made by the central station or by the dealer. A paper on "Practical Central Station Salesmanship," too long to be printed in full in these columns, is herewith summarized as to its salient features. Though confined to the sale of appliances by central stations it is filled with helpful hints for the dealer. The author is general manager of the Pacific Power and Light Company at Portland, the other members of his committee being George Bowen, S. A. Hoag, W. H. Lines, Lewis A. Lewis, and C. R. Young.—The Editor.)

Western central stations ought to sell at least \$10 worth of electrical appliances to each consumer every year. Prices should not be cut. Profits should be at least 15 per cent. Installment sales should be encouraged.

Regular advertising should be carried in newspapers and favorable news items in every issue. Circular letters should be used only with carefully selected lists. Envelope stuffers in mailed monthly statements are effective. Demonstrations at fairs or clubs are good advertising but an expensive means of creating interest. Cooking schools are valuable means for selling ranges. House magazines and a company bulletin are effective means of stimulating merchandise sales. To benefit from field publicity "requires a man competent in passing on all forms of publicity and who, without being tied down will not deviate from the central station policy."

Greater effort should be put forth in exploiting the efficiency of electrical appliances in the home by the manufacturer. A \$100 washing machine costs \$17 a year to operate, including depreciation and current. The expense of a laundress for a family of four is \$117 a year. This machine in its 12 years of life will pay for itself and return an actual saving of \$100 per year. Capitalizing this saving, shows that the real value of a washing machine from the standpoint of comparative results is \$1100, ten times its actual cost.

It pays a central station to merchandise lamps and motors. Bake ovens and electric water heaters should be sold at a profit.

Range sales are stimulated by a bonus plan. Salesmen should be specially trained. Liberal time payments are necessary. Every range sold should be closely followed by a home economist unless otherwise requested. The first bills should be carefully analyzed before sent out. The straight house-to-house canvass is the most successful method of securing prospects.

The Electric Store

An electric store is a valuable auxiliary for increasing the load of existing consumers. They should be conducted under the policy of earnest and sincere co-operation with all the dealers, coupled with actual assistance along the lines of co-operative advertising and sales campaigns. "Take the dealer into your confidence, educate him along modern merchandising lines, and the time and effort thereby spent will repay you many, many fold. We sometimes note cases of central station merchandising going to extremes along these lines. For fear of incurring the displeasure of dealers, we even find stores established and conducted simply for display purposes and no actual sales made. We believe this plan to be wrong, both in theory and execu-

tion. No doubt the interest of the consumer is aroused, but what guarantee do they have of it being sustained. In other words, the time to turn a prospect into an actual sale is now, and if the opportunity is once passed up it may never occur again. As an answer to the argument in favor of these so-called display stores, we find in the larger cities where modern and aggressive electric stores are conducted by the central stations for the actual sale of appliances, that the large volume of business done by these stores actually stimulates sales on the part of the dealer, no doubt directly due to the far-reaching educational work conducted by the central station stores."

"In this so-called service branch we find our only excuse for departure from modern department store practice. In ordinary merchandising the sole source of revenue and profit is in the sale itself and the merchant confines his service effort only along such lines as will induce the consumer to call on him again when in the market for additional commodities. In this respect our problem is radically different, and we can well afford to go to lengths in this work which it would be suicide for the ordinary merchant to attempt. The cost of this class of work is properly a charge against light and power earnings rather than against the operation of the store proper, and if the correct segregation of accounts is kept, no burden will be placed upon the store thereby. In fact, liberal service work is bound to stimulate further sales and thereby become a direct benefit to the store proper.

"The continual watchword in the conduct of the store should be 'maintain prices and merchandise for profit.' A survey was recently made in one of our larger Pacific Coast cities to determine how many dealers, electrical and otherwise, were selling appliances. The result of this survey was conclusive proof of the value of the policy maintained by this particular company. It was found that one hundred and one dealers were handling a complete or partial line of appliances and that these men considered this field a very valuable and lucrative one. It was further found that in two of the larger department stores the sale of appliances was on a greater scale than in the electric store itself. The reasons for this are not difficult to find. In the first place, these department stores were merchandising along somewhat better lines than the central station. Again the average housewife runs an active account in one or more of the larger department stores, and as a rule has occasion to visit them at more or less frequent intervals. What is more natural than her attention being attracted to a well displayed line of electric device, her interest aroused, that an order be entered to 'charge and send.' We have often assumed that an electric store if properly located, is one of the

best fields for the sale of appliances on account of the fact that our consumers make monthly trips into or past the store to pay their bills. There is no doubt that in this respect the electric store has some advantage, but it is in many cases given altogether too much prominence. There is a psychological question as to whether a consumer about to pay a bill, the size of which is many times questioned with or without due regard to conditions, is in a proper mental attitude to purchase a device to even further increase his bill.

"Any method which permits the advent of one hundred and one satisfied dealers into this appliance field is worthy of consideration and even duplication as it is a self-evident fact that ultimately more appliances will be sold in this manner than any one electric store could possibly hope to sell.

"The whole matter can be summed up by stating that the central station must merchandise along lines which will present conclusive proof that an actual profit can be and is made and further, the dealer must be convinced of this, his confidence and support secured and nothing undertaken on the part of the central station to destroy this confidence or weaken this support.

"The electric store if properly conducted along modern merchandising lines must and will show a profit on the actual goods handled. If the reverse is true, the trouble will be found in a neglect of one or more of the fundamentals which we have here attempted to outline in a brief and general way, and above all let us thoroughly grasp the evident truth that the electric store today is one of the most important if not the most important branch of our new business endeavor, and once this idea becomes firmly planted in our minds we will proceed in its operation with the same diligent efforts which have brought us success in other branches of our work."

A store should be conducted strictly as a merchandising proposition. Methods and policies of large department stores should be studied and adopted. Selling campaigns of limited period and seasonable usefulness, good locations, fine appointments, forceful advertising and practical demonstrations are essential features. Store employees should be assembled in frequent meetings wherein they are taught the real value of the article for whose sale they are responsible. "A distinction should be sharply drawn between real value and mere selling price, and they should be thoroughly imbued with the idea of subordinating the element of selling price and substituting therefor the idea of real value, and to think and talk in terms of the latter. The measure of value of any such device depends on factors in no manner related to the actual cost of production, and sometimes widely separated from the selling price. Our economist friends tell us that such devices get their value from the standpoint of the result accomplished with a certain expenditure of energy as compared to an equal or better result which might be obtained with an equal or less expenditure by means of some similar device. Viewing our electrical appliances from this angle we are struck with the fact that their value in most cases greatly exceeds the selling price; that in their particular field of application no substitutes have as yet been found to accom-

plish equivalent results with anywhere near the same expenditure of energy. So let us put proper emphasis on this factor of value and demonstrate to our prospects the field of usefulness of these devices, the work they can accomplish, and let us subordinate the factor of price and raise that of performance."

"No electric store can possibly achieve a maximum of success unless every possible effort is bent toward keeping the appliances once sold in useful and workable condition, or if they become obsolete to replace them by new ones. Encourage all consumers to bring defective devices into your store for overhauling, irrespective of whether you made the original sale or not. This plan will greatly stimulate sales on the part of smaller dealers, who cannot afford to carry their service work to the extent you can and must."

PROGRESS ON THE SAN PABLO DAM

In the issue of the Journal of Electricity for March, 1, 1917, page 155, an account was given of the beginning of the new San Pablo Dam which is located in the San Pablo Valley about five miles north of Berkeley, and five miles east of the city of Richmond, in California.

Since that time work has progressed upon the project and its progress has been watched with unusual interest by engineers, in that its inception was



A Form for the Study of Earth Repose

fraught with a hard fought hearing before the California Railroad Commission and in the face of a constantly increasing rise in costs of material and labor.

The month of September witnesses the temporary dam practically completed with a storage of water backing up in the channel of the creek for nearly a mile. The outlet tunnel has been driven, while the fifteen thousand foot tunnel that is to pass from a pond about a mile up from the dam, under Wildcat canyon, and out near the cemetery in North Berkeley, has been started.

The debris surrounding the former study in the character of earth at the damsite, a picture of one of the forms for which is shown herewith, has been removed and the effects of new construction work is visible on all sides.

The force of men working at the dam site has been greatly reduced. On the other hand progress on the long tunnel is very noticeable and this phase of the work is being pushed by the contractors with all reasonable speed.

THE ENGINEER AND THE COMMERCIAL DEPARTMENT

BY D. F. HENDERSON, L. T. MERWIN, J. L. DUFFY,
J. C. HENKLE, A. S. HALL

(In the ideal situation, a single man trained along both commercial and engineering lines can handle to best advantage the building up of new business for a power company. Here is an excellent paper that will be of interest to all men of the industry throughout the West, in that pointers are given as to how the engineer may assist the commercial department in cases where the combination of commercial and engineering departments is beyond the capacity of a single man. The paper is to be read before the Spokane convention of the Northwest Electric Light and Power Association, September 12-15, 1917.—The Editor.)

The commercial man is often influenced by his desire to secure new business at a low cost, and he will overlook the fact that poorly built lines and equipment not properly installed will in all probability eat up all the profits of the business in maintenance and operating expense. On the other hand, the tendency of the engineer to install equipment and slightly work may lead him to refinements of construction not justified by the revenue secured from the business. There are many cases where the cheapest possible line to supply the immediate needs is the one to be built, but lines of that character form the smaller part of a central station's system, the majority of the business secured by such companies being of a rather permanent character and the ultimate economy of the equipment installed should be the governing factor. Operating features and reliability of service are important features and one must look into the future somewhat and imagine all sorts of happenings and try to determine what their effect would be in order to properly decide on the type of construction best suited to a particular case.

The primary object of the commercial man is to increase the business of the company and one of the principal ways of accomplishing this is to secure new customers who may or may not be located upon the company's lines. The commercial man finds through one or more of various channels that certain business may be secured and it is his duty to investigate and secure this business, if it is a desirable business for the company to have on its lines. In order that this business be served to the best advantage the various factors entering into such service must be carefully investigated and considered. Before approaching the customer the commercial man should know approximately whether or not it is within a reasonable cost to supply the service wanted. In the small ordinary business he can usually tell from a glance at the records in the engineer's office as to the probable cost of supplying the service and decide whether or not it will be profitable business. As our rates are now well standardized it is only necessary to estimate the amount and the time the customer will use his equipment to obtain the revenue and if this does not warrant the expense necessary to serve the business, the business should be rejected unless for reasons of policy it must be accepted or unless a portion of the cost is paid by the customer.

In cases where it is not at once apparent that the business can be secured and not apparent that the business once it is secured will be profitable, the commercial man should make a careful study of the situation as to the probable use of the power, estimated revenue, the permanency of the installation, time of day the

load will be on, the importance of continuous service, etc. When this information, together with the location of the proposed service, is given to the engineer an estimate of cost and operating conditions can be made. If the business is of a permanent nature the construction work should be done in such a manner that it will still be serviceable after a long period of time. In ordinary practice all equipment should be of a character that would require small maintenance cost and provide safety to the public and to men working on the equipment. In cities and towns all work should be of the very best; wire sizes, capacity of transformers, etc., may be kept at a minimum, for increasing their sizes is not a serious matter except in the case of high voltage lines, where an interruption of service would be necessary to make the additions.

In building lines and supplying service to small communities a careful canvass of the prospective load is necessary. Comparisons with loads in other small communities are often of little value. An instance of this is shown by the experience of one northwest company in building into two small towns. The first town supplied was provided with a capacity of about 150 k.v.a. and the actual load was about 25 k.v.a. A similar town nearby was later supplied and the experience in the first town was used in determining the load to be expected. The new town proved to be a much better town and the load very quickly exceeded the 35 k.v.a. for which the line was built and business had to be refused, for the additional expense in rebuilding sixteen miles of 6600 volt line was more than the additional business was worth. Capacity sufficient to care for the increased load could have been supplied at the time the line was built for a very small increase in cost of line. This illustration simply shows that a careful study of all the conditions affecting a given proposition must be made. It is of doubtful economy to so cheapen the construction of a line to a new community that it will show a return on a certain definite known load in order to get authorization for the building of the line and then later to have to refuse business or rebuild the line. If the community to which the line runs does not show that any growth will take place, it is questionable whether or not the line should be built. On the other hand, construction not warranted by the business secured should not be put in. No doubt many lines have not been built, on account of the high cost, which could have been made into paying lines had better judgment been used in making the preliminary surveys, both commercial and engineering. It is necessary for the engineer and the commercial man to get together and work out the problem to decide on the relative importance of the various items entering into the business.

In city construction, excepting power loads, the growth of the service can be fairly well estimated by comparison with other parts of the city and with past loads. Such estimates are, of course, materially affected by the improvements in appliances and lamps. The introduction of the tungsten lamp changed conditions in both residential and commercial districts to a great degree and the introduction of electric cooking devices promises to work as great if not greater change in central station policy.

There is probably no part of the central stations' activity where the commercial men and the engineering men need to be in closer touch with each other than in the pioneer work of introducing electric ranges and water heaters. The central station comes into more intimate contact with its customers in supplying this class of service than it does in any other. There is also a new element introduced, in that our dealings are with women to a much greater degree than in our other business. The electric range to a majority of our customers is a thing of the imagination and to successfully introduce it to them will require much work by the commercial men and also by the operating engineers. The operating engineers must see to it that the service supplied keeps the range sold after the commercial man has closed the actual sale. To begin with, a prospective customer under present conditions often takes a long time in deciding to have a range installed, but after having once decided is very anxious to have the service at the earliest possible moment, a natural desire, but one which may add materially to the central station's installation cost. Our present distribution systems are not designed and have not the capacity for a range of from five to ten kilowatt demand without reinforcing. When business is brisk the work of rebuilding the lines and installing the ranges can be materially lessened by the proper routing of the work. This may mean that some customers receive service more quickly than others and the commercial man in selling the range can assist the engineer by using good judgment in making promises of service. As one of the most serious handicaps to the range business is the cost of handling the service and installation of the range, anything that will tend to save money along this line should be given careful attention.

Now, as to the character of service required by electric cooking equipment, all are agreed that the service must be supplied from the regular 110-220 volt lighting mains, separate service for ranges being prohibitive in cost. In some cities the rates are such that separate meters are required, while in others all current is measured through one meter. Electric cooking appliances require good voltage and reliable service, so the best of construction should be installed. Poor service to a range customer not only means poor service to the one customer, but to his neighbors also. Fluctuations in voltage not only result in poor operation of the range, but of the lights, which is particularly disagreeable to the neighbor who does not have a range.

With the present prices of copper, in the majority of places it is cheaper to extend the primary feeders and install a transformer for range customers than to

increase the size of secondary conductors. The experience of one northwest company along this line shows that the average cost of building the necessary line and running the service is about \$100 per range customer where additional capacity in the line is required. This covers the cost of wire, transformer, poles, etc., and labor. Approximately 80 per cent of the ranges installed require additional line capacity, the other 20 per cent being located near a transformer or on a secondary main of large size. This percentage, where no construction is required, is gradually increasing as the number of ranges increases, for one range in a neighborhood often sells another one nearby.

Before we reach the point where a large percentage of our customers are using electric ranges, and we have from five to six ranges in every block, we must change our method of supplying service.

From data obtained by investigations of demand factors on several lighting feeders in Spokane it is estimated that we may obtain a demand factor of approximately four for groups of ranges on lighting mains. Using this value as a minimum (and we hope that the actual demand factor will in reality be greater than this) it will be necessary to provide secondary mains in each block to provide a load of $7\frac{1}{2}$ k.v.a. in range load, assuming an average demand of 5 kw. per range. In addition to this a load of 15 kw. per block for lighting must be added, making a total load of 9 kw. per 1000 ft. of street. As a 30 k.v.a. transformer is a good standard size for use on overhead distribution lines, good practice would indicate that a 30 k.v.a. transformer be installed every thousand feet. To supply proper voltage to the service switch secondary mains of 1/0 copper would be required. The conductor cost per thousand feet of this size would be approximately \$336 installed. (This is figured at 35 cents per pound in place; present indications are that copper will continue to be high in price for some time.) The transformer would cost approximately \$200 installed, making a total of \$556 for transformer and secondary mains. Transformer and secondary mains to supply the lighting load of this same territory would cost approximately \$65 for the transformer of 5 k.v.a. capacity and \$84 for a No. 6 secondary main, a total of \$149 per thousand feet, extra guying due to heavier conductors would amount to about \$20 per thousand feet. The additional cost of the larger service over a lighting service and the additional cost of a larger meter is about \$8 or \$134 per thousand feet. The total additional cost of supplying the thousand feet of combined range lighting load would then be $\$556 + \$134 + \$20 - \149 or \$561 per thousand feet. As we have assumed an average of 16.7 ranges per thousand feet the additional cost to serve range consumers would be $\$561.00/16.7 = \33.30 .

Primary feeders to supply these transformers must be provided. A 150 ampere regulator is a convenient size, and a 4000-volt four-wire feeder would care for approximately 900 k.v.a. load to a load center $1\frac{1}{2}$ miles from the station, with a wire size 1/0 copper. From the load center the feeder would divide into three single-phase feeders and approximately $2\frac{1}{2}$ miles of wire would be needed in the branch feeders. A feeder of this character would cost approximately

\$8750, or \$2920 each, exclusive of pole lines, considering the feeder as three-phase feeders. A primary feeder to supply the lighting load for this same territory would cost, with No. 6 copper, approximately \$1200, the cost of lighting feeders being much more per kw. of capacity than the heavier feeder because the load is scattered over such a large territory and operating conditions would require that the feeders be confined within a reasonable territory. Deducting this from the cost of the heavier feeders gives an added cost of \$1,720 for the range load.

The demand factor of the ranges supplied by this larger feeder would be about 5. Reducing this to the basis of one block we would have a demand of 6 kw. instead of the $7\frac{1}{2}$ kw. as in the case of the secondary mains. Adding to this the 1.5 kw. lighting load gives us a total load of $7\frac{1}{2}$ kw. per block or 20.8 kw. per 1000 ft. Each single phase feeder is sufficient to carry a 300 kw. load and would serve a territory having $(300/20.8)$ 14,400 ft. of secondary main. As we have assumed a supply $14,400 \times 16.7$ or 235 ranges. This gives us a cost per range $1710/235$, or \$7.30 additional to the cost of lighting service. This makes a total conductor expense additional to lighting service of $\$33.30 + \7.30 or \$40.60 per range.

The above figures cover the necessary feeders, transformers, secondaries, meters, etc., to supply a mixed lighting and range load at the time the range has reached a density of six 5 kw. ranges per city block. The time that will elapse before this density will be secured has a great bearing upon the determination of the type of construction that should be installed at the present time. This load is being built up gradually, a range here and a range there, and our problem is to decide on the best course to follow. As explained earlier in the paper, present practice of most companies is to run small primary wires and install small transformers at or near the point where the range service leaves the secondary mains, at a cost of about \$80 per range on the lines. The difference in cost between the two methods does not necessarily mean that it will cost that much additional per range when the total number has been installed, for as the territory becomes saturated a large number of these transformers will be removed and a part of the copper replaced and considerable salvage will be secured, but there is no doubt that the present method is the more expensive one and the difference is great enough to warrant the various companies in making a very exhaustive survey of their system and determine the procedure to be followed. To make an estimate of the growth of the range business will require that the commercial men and the engineers work together on the problem and give their best thought as to the time and place where range load may be expected.

As has been pointed out after the range has been installed it is the duty of the central station to see that it gives satisfaction and salesmen and demonstrators can materially increase the service a range gives by fully explaining the various features of the range and its operation. Experience has shown that this has been done to a great extent, for comparatively few of our complaints are traceable to misuse by the customer. 'Tis true we run down cases of trouble and

find them to be due simply to the turning of the wrong switch, not closing the circuit breaker, cleaning open coil elements while current is on, etc., but the most of our expenses in maintaining ranges is due to burned out coils, breaking down of switches, etc. One company has found that over a six months' period with an average of 374 ranges in service the maintenance and operating costs amounted to 88 cents per range per month, and was divided as follows: Labor, 38 cents; transportation of men and materials, 6 cents; material (new elements, switches, etc.), 44 cents. It is to be hoped that this cost may be reduced, guarantees on range parts are becoming more standardized and the tendency is for central station to charge the customer for these repairs after the guarantees have expired.

Water heating in connection with range installation presents a somewhat different problem, as the water must be conserved more than when heated from a furnace or a coal range, and salesmen, demonstrators and trouble men can all "do their bit" toward bettering conditions. Few customers pay any attention to the quantity of water used or wasted. Dripping faucets and poorly arranged plumbing are points that cause poor service from a water heater, and imagination has much to do with the attitude of the customer. This is illustrated by the experience of one man who thought he had a two kilowatt heater and who had plenty and to spare of hot water. One day there was trouble on the circuit and he discovered that the heater was really only a one kilowatt heater and since that time he has been complaining that he does not get sufficient hot water.

The above illustration simply serves to point out that the commercial men and the engineers of a central station have largely the same problems and that it is extremely necessary that they work together and not get "wires crossed," and each company must fit its organization to meet its own problems and the individual characters of its men.

CENTRAL STATION ENLISTS HOUSEWIVES IN FOOD PREVENTION

Considerable interest is being aroused by a window display of the Glenwood Light & Water Power Company of Glenwood Springs, Colorado, in which fruit and vegetables are dried by an electric fan. Four racks made of light wood with wire mesh bottoms are set up in front of a 10 in. Westinghouse fan. Each rack is large enough for six quarts of material. A watt-hour meter indicates the exact cost for each run. In an advertisement in the local paper the company asks housewives to bring their fruits and vegetables and have them dried free of charge. Reference is made to Farmer's Bulletin No. 841, which describes the process.

The efficiency of a pump means the total work performed as compared to the power required. The weight of water pumped per minute times the total head in feet will give foot pounds; this divided by 33,000 gives the theoretical horsepower or the work performed by the pump. The power delivered to the motor, measured by checking the meter with a stop-watch, shows the electrical input figured in horsepower.

CO-OPERATION WITH ARCHITECT AND CONTRACTOR

BY A. C. McMICKEN

(These pertinent suggestions as to bringing about a more complete wiring of homes and apartment houses place the initiative and responsibility on the central station. They constitute the gist of a valuable paper on "Co-operation in Modern Home and Apartment House Wiring Practice" to be presented before the Northwest Electric Light and Power Association convention at Spokane this month. The author is sales manager for the Portland Railway, Light and Power Company, and was assisted in the preparation of this paper by H. H. Schoolfield, F. H. Murphy, Foster Russell and L. R. Grant.—The Editor.)

The steady increase in the efficiency of incandescent lamps and the constant revision downward of lighting rates is seriously affecting residence earnings and the problem of keeping these earnings up is not solely one of selling current-consuming devices, but includes providing facilities for using them conveniently and safely.

We should be looking ahead, not one year or two years, but ten years, and endeavor to picture conditions in the future. Begin now to prepare for changes which are bound to come at least insofar as they will affect the use of electricity in the home.

During the past ten years the more common lamp socket devices have sprung into being and have become well established, and now the vacuum cleaner, washing machine and electric range and water heater are becoming recognized as practical household necessities. The electric range is not yet universally established and accepted—not because it is not a splendid cooking medium, but because we have not all gotten behind it, and because we have not yet had time to educate our consumers to its many advantages.

The day of the electric range is fast approaching, as also is the day of every other electric household labor saving device. Fuel, whether it be oil, coal, wood or gas may be expected to increase in price as time goes by. This is our opportunity. Are we preparing for it?

In order to arrive at some definite idea for co-operation sets of questions were sent to architects, building contractors, wiring contractors and central stations. From the answers to these questions it is apparent that the architects consider that they are specifying ample circuits for lamp socket devices and the like, but are not yet convinced that circuits for ranges and water heaters are necessary; and it is further apparent that but a small percentage of homes are built under the architect's supervision.

Someone has said, "You can't tell an architect anything." Have you a wide acquaintance among the architects in your territory? Do you know a class of men any quicker to adopt improved methods and practices? Perhaps the reason you do not get full co-operation from architects is due to your method of approach.

Building contractors and home building companies and associations who build homes for sale costing from \$4000 up provide a fair amount of convenience circuits and outlets, but need to be educated to greater effort. The vast majority of houses built without architects' supervision, whether for sale or for the owner, do not have sufficient convenience circuits and outlets and in many instances do not have ample lighting circuits and switch control. This is largely due to houses being

built for a lump sum, the wiring, as well as other items, is cut down.

Both building and wiring contractors report that they have difficulty in convincing the owner of the desirability of convenience circuits and outlets except for certain appliances such as an iron outlet in the kitchen. In most instances the matter is given little consideration by either the building contractor or the owner.

The contractors suggest that suitable literature setting forth the desirability, convenience and utility of convenience circuits and outlets sent the owner or prospective home builder when plans are being made or at the time building permits are taken out would greatly assist them in having such circuits installed. They suggest that this should be the function of the central station.

It is well to state here that we cannot expect to have the co-operation of the wiring contractors if we are to compete with them in their field. Electrical contracting is a legitimate and specialized business, and one in which the central stations should not engage unless the community served is too small to support a local wiring contractor. Some central station managers still consider the contractors fair-weather friends, and make no effort to really get acquainted and find out that the average contractor is a regular fellow after all.

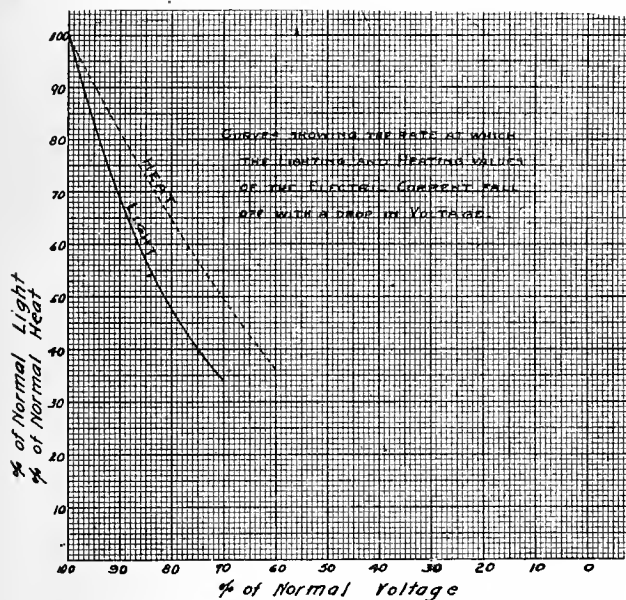
It has been proven that the wiring contractor can be of great assistance in inducing the owner, architect and building contractor to make provision for range and appliance circuits and outlets. In many instances the contractor also sells appliances and is therefore doubly interested in seeing ample convenience circuits and outlets installed.

Houses and apartment houses built for sale or rent will not do, either, unless wired for electricity and the demand for convenience circuits and outlets is increasing. A woman used to electric light and appliances, when house hunting invariably notices whether the switches are conveniently located and whether convenience receptacles are provided. Many already built houses have been wired solely because the occupant wanted to use an iron or other device.

Salesmen for one of the large home building concerns carefully call the attention of prospective buyers to the ample and conveniently located switches provided and also to the baseboard, wall or floor receptacles in every room for the vacuum cleaner, piano lamp, etc. They know it helps to sell the property.

The fact that practically every house and apartment building erected in the last four or five years in the Pacific Northwest was wired at the time for electric light does not mean we need not bring to the attention of the builder and owner the desirability for a better standard of wiring and illumination.

A home or an apartment house is not built to last a year or so, but to last a lifetime. Why not wire it now so that electricity may be conveniently and safely used to operate anything from an iron to an electric range? The owner may not contemplate installing an electric dishwashing machine in the kitchen at present, or a washing machine in the laundry, but he will have both some day and the outlets should be provided while the house is still on paper and the outlets can be added with the least additional expense.



Relationship of Lighting and Heating Values with Drop in Voltage

The following suggestions are therefore made to member companies:

Get acquainted with and seek the co-operation of the electrical contractors in your city or town. Go out of your way to help them and they will be more than glad to reciprocate. If the electrical contractors have a live association your problem is greatly simplified, and their assistance backed by their association can be secured and will be of great value. If the electrical contractors in your town do not have an association or do not belong to the state association, urge the latter to get them in. If this cannot be done, you can at least get them together and work out a mutual co-operative plan in your city or town.

Have your salesmen keep in touch with the wiring contractor. Many times after the wiring contract is let, co-operation of the contractor with a central station salesman has resulted in additional wiring. The electrical contractor and the central station salesman by good team work can influence the owner, building contractor and architect.

Every central station salesman should know more than the rudiments of illuminating engineering and good wiring practice and should be able at all times to make pertinent suggestions to the contractor and the home builder, which, if adopted, will provide good illumination and for the convenient use of current consuming devices.

Most important of all, you should endeavor to see every home owner as soon as you have information

that he is about to build. Every man and woman building a home wants to include in it every convenience and comfort that their means will permit. Much time and consideration are given to planning the new home, but in the majority of cases the matter of electrical wiring is not understood or is not given the consideration it warrants, and when the home is completed regret is often expressed because convenience outlets were not installed for the vacuum cleaner, percolator and other devices, and the home builder cannot understand why the fixtures and glassware which looked so well when purchased proved so disappointing when installed. The interiors of many otherwise beautiful homes are marred by fixtures improperly located, inharmonious in appearance and improperly equipped with glassware.

We believe that suggestions for convenience circuits and outlets properly made to the home builder will be gratefully received, and that this should be as much the duty of every salesman as to secure the lighting contract. If you cannot have a competent salesman call and present arguments for better lighting and convenience outlets, send suitable literature, or, better still, send the literature and follow it up by a call from the salesman.

The N. E. L. A. Publication Committee has recently issued a handsome illustrated booklet with this purpose in mind and they can be purchased in any quantity for distribution in your territory. Architects, contractors and builders can use advantageously, and the central station can mail them to the owner with a suitably worded letter offering the services of the illuminating engineer or the man in the organization capable of doing this work.

If you feel that the expense of purchasing or having printed suitable literature of this character is too great, it is at least possible for every central station to prepare a letter setting forth concrete reasons for convenience circuits in the home and designed to create a desire for electric labor saving devices, which can be mailed at small expense.

We believe that the larger central stations can well afford to employ an illuminating engineer, who can make himself invaluable to the architect, contractor and owner by preparing wiring plans and specifications and making suggestions as to the color of walls, ceilings and draperies best adapted to the lighting effects desired, with due consideration for the type and class of fixtures and glassware to be used.

The illuminating engineer will also instruct and assist the salesman along illuminating engineering lines, which, by the way, is not confined to the proper design and location of lighting installations only, but applies equally as well to making provisions for current consuming devices and motor loads.

After all is said, the man who pays the bills is the man who must be convinced. Co-operate with the architects, the building and wiring contractors, but above all bring your heavy artillery to bear on the home builder and owner. He will spend the money for comforts and conveniences for his loved ones if you can convince him that electricity will lighten their household tasks and make life more enjoyable.

RECENT PROGRESS IN ELECTRIC WATER HEATING

BY A. STRAUCH, L. R. GRAND AND R. A. WILLSON

(Herein are briefly summarized the important features in a paper to be presented at the N. W. Electric Light and Power Association Convention. Full details are given regarding proper rates, the selection of the heater, the manner of installing and the thorough insulation of the boiler.—The Editor.)

Electric water heating is the necessary complement to successful electric cooking. Without it the consumer derives only half the anticipated convenience, comfort and cleanliness of the electric way and the central station only half the revenue.

Contrary to the general practice in the Northwest of making a certain meter rate for cooking and a flat rate for water heating the committee recommends a sliding scale block rate designed so that the

heater required can be obtained from the formula watts

$$\frac{146 \times \text{gallons} \times \text{deg. F. rise}}{\text{minutes} \times \text{efficiency}}.$$

The efficiency will

depend upon the size of the boiler, the insulation of the boiler, heater and circulating pipes, and the size of the heater, but for average conditions if the boiler, pipes and heater are properly insulated it will be sufficiently close to assume an efficiency of 85 per cent. The size of heater and hours of operation are also dependent upon the capacity of the boiler. With a large boiler a smaller heater can be used which will operate a greater number of hours per day, but will be capable of caring for the demands on account of the greater capacity on storing hot water. The average small family of 3 or 4 persons can be satisfactorily taken care of with a 30 gallon boiler, and a 2 kw. thermally controlled circulation type heater, while in larger families of 6 to 8 persons it will probably be necessary to use a 3 or 4 kw. heater of the same type, providing it is used on a 30 or 40-gallon boiler.

The method of installation is of the utmost importance and means the success or failure of the whole service. The heater should be attached to the boiler as shown in Fig 1. The bottom of the heater must be as low or lower than the bottom of the boiler, otherwise the water will not continue to circulate after it has been heated down to a level with the bottom of the heater, but steam will be produced (the thermal switch not operating if installed at the bottom of the heater until hot water begins to feed into it) thus reducing the storage capacity of the boiler. The heater should be so connected as to take cold water from the bottom of the boiler and deliver hot water at the top; it should never be tapped into the side as is the usual practice for connecting the water back of a stove. This for the reason that should all the hot water be drawn off, in a few minutes there would again be a small supply at the top of the boiler with which to meet further demands. There should be inserted above and below the heater square head service cocks, and between the heater and the cocks, unions, one on either side of the heater, then in case of trouble the two cocks may be closed and the heater easily removed without drawing off the water. Further, the most important function of one of these cocks is to restrict the circulation of the water, so as to cause it to heat to a high temperature before passing out of the heater. There are three makes of heaters fitted with restricted openings for this purpose, but so far as this Committee knows they are the only ones so arranged, and even though the heater may be so fitted, it is desirable to use the cocks if for no other reason than the added convenience in case of trouble. In setting the cocks it is desirable to close them to a point where the water when it passes out of the top of the heater

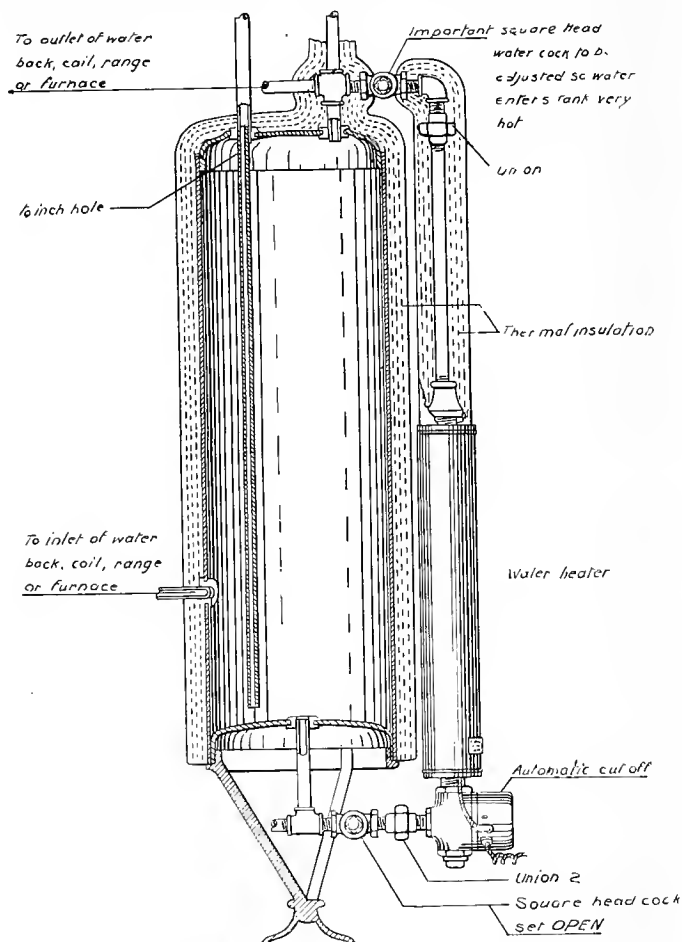


Fig. 1. Method of Installing Electric Heater

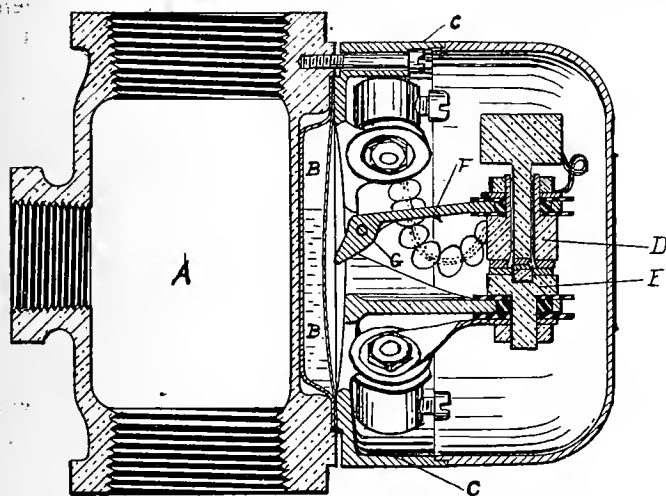
average lighting can be covered by the first step, the cooking by the second step and the water and air heating by the third step. A yearly minimum is preferable to a monthly minimum.

By using a large capacity heater installed with a double throw switch between it and the range the maximum demand is reduced and the load factor improved while the service is in no way impaired. An automatic circulating type of heater gives the best service.

The consumption of such a heater averages 3 to 4 kw.-hr. per day per person and in general a rate of 1c per kw.-hr. will make the cost of operation satisfactory to the average consumer.

Size of Heater.—If the maximum demand in gallons of hot water per 24 hours is known the size of the

is at a temperature of 160 degrees to 175 degrees F. Another function of the cocks is to retard the by-passing of cold water through the heater when hot water is being drawn from the top of the boiler. Without the cocks there is a marked tendency for cold water to pass from the bottom of the boiler through the heater and mix with the hot water being drawn from



The Thermal Switch for Electric Water Heating

the top, thus reducing the temperature of the water before it reaches the faucet. The cocks when properly set offer sufficient resistance to reduce the by-passing to a negligible amount. It is desirable to use square head service cocks rather than Globe valves as the cocks are set with a wrench and tightened up where they usually remain. While in the case of the hand operated valves, there is too much temptation on the part of the consumer to turn them and thus change the adjustment.

Boiler Insulating.—After the heater has been connected to the boiler, and the cocks properly adjusted, the boiler should be thoroughly insulated from bottom to top including the heater and circulation pipes as well as the hot and cold water pipes leading from the top of the boiler to the point where they enter the wall.

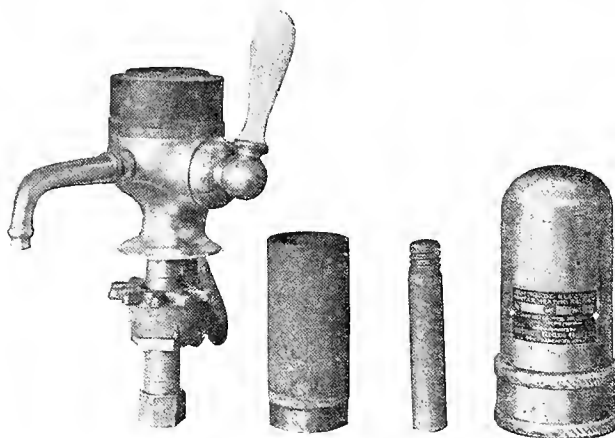
If such a cover as the J-M "Economy" Felt Jacket is used, it should be well sewed up and a bottom section used to entirely cover the boiler. The heater and pipes should be well insulated with magnesia or a similar pipe covering about 1 in. thick. If Sil-O-cel is used, a box should be constructed about the boiler allowing approximately three inches of space between the sides of the boiler and the box, which should extend well above the top of the boiler so as to allow of a good deep covering of the insulating material over the top including the pipes as mentioned. It is usually possible in such cases to run the circulation pipe inside of the box from the top of the heater up. In such cases the heater and exposed portions of pipe can be insulated with magnesia covering, or another box may be constructed enclosing the heater and these pipes. In case the circulation pipe can not be enclosed in the box with the boiler it must be covered.

Automatic Thermal Switch.—There is now on the market a simple and reliable thermal switch which can be easily installed in the pipe below any of the standard circulation type heaters, thus making them

automatic, so that non-automatic installations can be readily converted to automatic at slight expense as the switch is sold for \$7.00 or \$8.00.

Automatic Immersion Heater.—The thermally controlled immersion type of heater can also be used in place of the circulation heater described, in which case the radiation losses will be somewhat reduced, due to the absence of the circulation pipes, and the fact that the heater is itself within the boiler, but unless the storage capacity is very large in proportion to the demand, so all or nearly all the hot water will never be drawn off, there is danger of having no additional hot water for a considerable length of time on account of the characteristic of this type of heater mixing the water and raising the temperature of practically the entire boiler at the same time, somewhat similar to the action of the water coil in a stove when connected into the side. If, however, the storage capacity is ample so there is always a sufficient quantity of hot water left at the top to care for the demands until the temperature of the cold water can be raised, this type of heater may be expected to give satisfactory results. But since these installations require so much more careful investigation to determine the exact demands, the capacity of boiler necessary, etc., and as the requirements may change after installation, it is probable that even though the efficiency of the circulation type heater is lower it will in general give more satisfactory service.

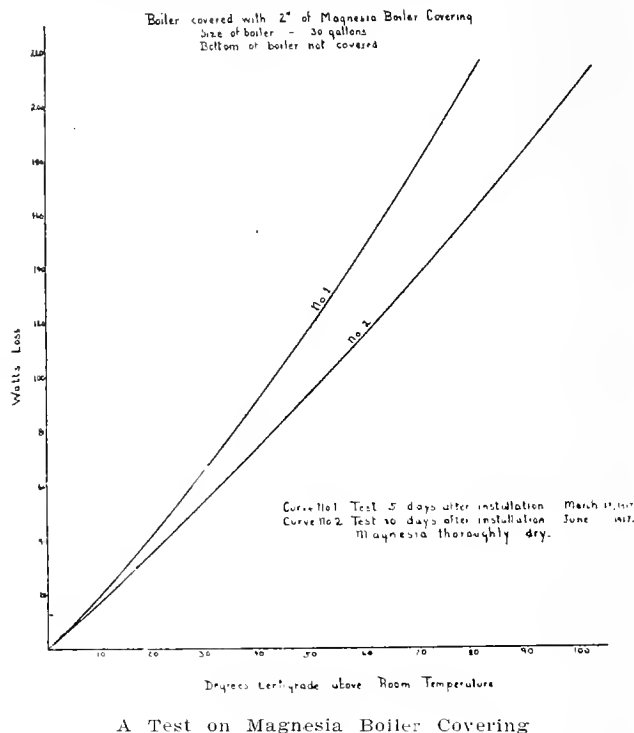
Non-Automatic Circulation Heater.—In case the rate is considered too high, or it is not necessary to maintain a supply of hot water at all times, the non-automatic circulation type of heater of rather large capacity installed as described for the automatic heater on a double throw switch with the range will give very good service but in case such installations are made it will be desirable to use heaters of a 4 to 5 kw. capacity in order to quickly produce a supply of hot water. With this arrangement it is possible to



Typical Details for Electric Water Heating Devices

get through with a much lower consumption of energy, for the reason that the radiation losses are reduced and if hot water is not always instantly available at the faucet, cold water will be used for many purposes where otherwise hot water would be drawn thus reducing the demand. This arrangement would equal the service of the ordinary circulation type gas heater and it is possible to furnish a limited supply of hot water at rates of 2c to 3c per kw.-hr.

Non-Automatic Immersion Heater.—A considerable number of non-automatic immersion heaters of small capacity have been installed in the Northwest, but as previously stated, heaters of this design cannot be expected to produce the results of the larger thermally controlled circulation type, due to the mixing characteristics and the impossibility of keeping up the supply under all demands. But of course they,



like the automatic immersion heaters, have a field and under certain conditions will produce satisfactory results.

Radiant Plaster Type Heater.—There is in use on the circuits of one station a heater of small capacity consisting of a number of radiant coils attached to an insulating block which is clamped to the side of the boiler, the advantage claimed for this heater is that it can be easily and cheaply installed, and that no trouble will occur due to a collection of deposit from lime in the water. But to offset these advantages it has the disadvantage of slowness, and the mixing of the water like the immersion heater, while it does not operate at the high efficiency of the latter type.

Instantaneous Type Heater.—If the rate is high and water is required at only one or two faucets the most efficient and inexpensive heater is the instantaneous type without coils or switch, and having the current limiting feature.

There is now available such a heater in which the heating element consists of two electrodes, one a tube and the other cylinder, the water being heated by the current passing through it from one electrode to the other, it acting as a simple water rheostat. By merely turning the valve water is slowly admitted from the bottom and gradually rises filling the space between the electrodes, and in so doing the current is correspondingly increased from nothing to maximum; when the valve is closed the water is drained from the bottom with the result that the load is gradually reduced to zero.

Therefore this heater, unlike other designs of instantaneous heaters, does not produce the detrimental effect on the regulation of the circuit. Heaters of this type of approximately 5 kw. capacity can be installed on double throw switches with ranges, and will produce water at any desired temperature up to the boiling point in limited quantities at a very low cost.

General.—These recommendations have been based on supplying domestic hot water service, for the reason that the subject is one of vital importance in connection with the introduction of the electric range, but the information contained herein will also be of value in the development of electric water heating in barber shops, hotels, restaurants, apartment houses; dairies, industrial establishments, etc.

The replies to a number of questions sent out to members indicate that some of the stations of the Northwest are actively after the water heating business since the nine companies reporting water heating have installed a total of 1930 heaters with a connected load of 3560 kw.; 1000 of these are on one system while 500 are on another. It seems the general tendency in this section has been to use mostly small non-automatic circulation type heaters, though there are also a considerable number of small capacity non-automatic immersion type, though every one admits they have some trouble in meeting maximum demands and the heaters are slow.

Practically all of the business is handled on flat rates, which doubtless accounts for the low capacity of the heaters and the small number of thermally controlled (or automatic type) heaters in use. This again brings to attention, the wastefulness and other short comings of the flat rate practice. While most of the companies appear to be insulating the boilers, it is rather surprising to note that the station with the largest number of heaters in use is not insulating many of the boilers. Since this is a matter of such vital importance on account of the extremely high radiation losses it is a matter that requires careful attention, and should never be neglected. Those who are not insulating the boiler are simply throwing away energy. For the benefit of those who are having trouble with scale forming in the heaters, the committee would suggest that they can easily clean it out by removing the heater and filling it with a 36 per cent solution of Hydrochloric acid, which will dissolve it almost instantly without damage to the heater. Where the water is bad they should be inspected and cleaned regularly. Practically all seem to be agreed that water heating will assist in the introduction of electric cooking.

All workmen's check clocks are controlled electrically in England by their Pulsynetic electric transmitter, thus insuring correct and uniform time throughout the establishment. The system is so elastic that any number of check clocks or time dials may be added to the circuit as the occasion demands, and alarm bells or sirens can be operated automatically to any given programme or programmes. In many instances these programmes vary with the day of the week, and also with the department.

COOKING TESTS BY FUEL AND ELECTRICITY

BY B. L. STEELE

(Electricity in cooking is each month coming to the front in ever expanding uses. Comparative tests of coal, kerosene and electricity for cooking have long been lacking throughout the West, where wide applications of the electric range are but waiting the proper scientific exploitation of the power salesman. Here is an excellent article on this subject compiled by the author, who is professor of Physics at the State College of Washington. The paper has been prepared for the convention of the Northwest Electric Light & Power Association at Spokane, Sept. 12-15, 1917.—The Editor.)

The results of comparative tests of coal, kerosene and electricity for cooking herein presented have been accumulated in connection with a special course in Physics which the writer has given for several years at the State College of Washington for the students in the department of Home Economics.

The efficiency tests of gas, kerosene, gasoline and alcohol burners and of electric heating appliances have been made each year by the girls in this course and have been carefully repeated and checked by the writer and laboratory assistants. The tests on coal ranges were made on the two Monarch ranges in the Home Economics department, on the ranges in the homes of students living in Pullman, and at sorority houses.

that, as the coal range is used for cooking in the average home, not more than one-fourth of the available space is utilized at any one time, and that the cooking operations are being carried on less than one-half of the time during which the coal is burning. If this estimate is correct, the average "cooking" efficiency of the coal range does not exceed two per cent.

Table No. 2

Kind of Cooking Equipment	Efficiency
Coal range (entire space utilized)	18%
Coal range estimated home cooking (about) ..	2%
Flame contact burners (kerosene, etc.)	28%
Electric heaters, surface	45 to 65%
Electric heater, enclosed	70%
Electric heaters, immersion	90%

The efficiencies of the flame contact appliances, which include standard kerosene and gasoline blue flame burners, alcohol lamp for chafing dishes, and gas burners, varied from approximately 20 per cent to 35 per cent. The caloric value of the various fuels were obtained either from dealers or standard handbooks, or were determined in the laboratory.

Nearly every kind of electric heating appliance was used and under widely varying conditions. Room temperatures, existence of air currents from open windows, material and condition of surface of utensil used, wattage of heater, relative size of heater and utensil, and quantity of water heated, were all found to affect the efficiencies very considerably, particularly those of the surface and immersion types. In these experiments the thermometers, standard ammeters and voltmeters and the balances used were such and the care exercised was such, that a variation in efficiency greater than 1 per cent was not to be attributed to accidental error.

Table No. 3 gives the data and results of several efficiency tests of electric heaters.

Table No. 3

Items	Surface	Heaters	Enclosed	Immersion
	A	B	Heater	Heater
Mass of water heated (grams)	4,536	4,536	2,268	1,360
Room temperature (Cent.)	21°C.	22°C.	21°C.	22°C.
Initial water temperature	18.2°C.	22.6°C.	16.4°C.	19.5°C.
Final water temperature	93.2°C.	96.5°C.	65.0°C.	92.0°C.
Temperature increase	75.0°C.	73.9°C.	48.6°C.	72.5°C.
Heat absorbed (calories)	340,200	335,200	110,225	98,600
Heater turned on	3:00	12:13	7:37	9:30
Heater turned off	3:32	12:58:30	8:33	9:46:49
Time in use (seconds)	1,920	2,730	3,360	1,009
Current (amperes)	10.32	8.69	1.63	4.00
Potential difference (volts)	115.0	115.0	110.0	110.0
Electric energy expended in heater (Joules)	2,278,656	2,730,000	602,448	443,960
*Heat equivalent of electric energy calories	544,221	652,000	143,880	106,033
Efficiency	62.5%	51.4%	76.6%	93.0%

*4187 Joules are equivalent to 1 calorie.

The average working efficiency of the electric range, as used in the home depends on so many factors that to make an accurate estimate is rather difficult. It is believed, however, that in the hands of those who have had a bit of experience in making the proper combinations of surface, enclosed and immersion heaters, the efficiency should be above 60 per cent.



The Jensen Apartments, Great Falls, Montana, Equipped with Electric Ranges

The cooking cost data were obtained at the Home Economics Practice Cottage.

Table 1 gives the value in calories, or the heat equivalent, of 5c worth of each of the various "fuels" at the prices prevailing in Pullman, Washington, in December, 1916:

Table No. 1

Fuel	Calories
Coal (Rock Springs) at \$10.00 per ton	32,250,000
Kerosene at 20c per gallon	8,550,000
Gasoline at 25c per gallon	6,130,000
Alcohol at 75c per gallon	1,340,000
Electricity at 3.85c per kw.-hr.	1,116,000

Table No. 2 gives the average efficiencies of the various kinds of cooking equipments. In determining the maximum efficiency of the coal range the entire top was covered with large vessels of water—e.g., wash boilers or five gallon gasoline cans, the oven being similarly used. The fire was not lighted until the initial water temperature had been taken and usually two pounds of kindling and ten pounds of coal were completely burned before the record of the final maximum temperature was made. It was estimated

Table No. 8 gives the cost by meals of a week's cooking on the coal range with the water front connected.

Table No. 8
Coal Range—Water Front Connected
Pounds

	Breakfast		Lunch		Dinner	
Day	Wood	Coal	Wood	Coal	Wood	Coal
Monday	5.50	4.50	6.50	9.50	3.75	9.75
Tuesday	3.75	6.50	9.25	7.00	6.00	7.50
Wednesday	6.00	9.00	5.50	4.25	5.50	3.25
Thursday	4.00	2.00	9.00	9.75	9.00	9.75
Friday	4.50	9.75	4.50	5.00	5.50	13.50
Saturday	6.75	5.50	6.00	11.50	3.75	11.25
Sunday	9.25	15.25	5.00	0.00	3.00	18.00
Total pounds.....	39.75	52.50	45.75	47.00	36.50	73.00
Costs in cents....	11.9	26.25	13.7	23.5	10.95	36.5
Total cents ...	38.15		37.2		47.45	
Cost per meal....	5.45		5.3		6.78	
Total cost for week.....						\$1.23
Average cost per meal.....						5.85 cents

In all three weeks' cooking was done on the coal range with the water front disconnected, four weeks with the water front connected and five weeks with the electric range. Table No. 9 gives the average costs per week and per meal of this work.



Electric Surface Meat Roasting Ovens at Sacramento, California

Table No. 9

Equipment	Average Cost	
	Per Week	Per Meal
Coal range, W. F. connected.....	119.6c	5.70c
Coal range, W. F. disconnected.....	77.4c	3.67c
Electric Range	78.5c	3.72c

The results speak for themselves in general, but it might be pointed out from Table 8 that with the coal range it costs very nearly the same to cook breakfast or lunch as to cook dinner, while from Table No. 5 it is seen that the cost for breakfast, the lightest meal, is about half the cost of dinner. Also, from Table No. 9 it is seen that it costs 42.2 cents per week to heat the water for domestic use with the water front on the coal range.

The writer realizes fully that the amount of data presented is far too small to justify the making of any very sweeping inferences, but at the close of the coming year he hopes to have very complete results.

In conclusion the writer wishes to express his best thanks to Mr. M. C. Osborn and to Mr. L. W. Kingsbury, both of the Washington Water Power Company, who have generously loaned equipment, and to Prof. Agnes Craig of the Home Economics department of Washington State College, who modified her plans at the Practice Cottage sufficiently to make possible the special cooking carried on there.

WATER POWER DEVELOPMENT IN NORWAY

Among the important companies that are utilizing the falls of the Bergen district for the development of power may be mentioned:

1. A/S Hoyanger. This concern was founded in 1915. It is capitalized at 10,000,000 crowns (\$2,680,000), fully paid up on February 1, 1917. The company is harnessing 20,000 horsepower and has 60,000 in reserve. It will manufacture aluminum, the raw materials to be imported from France, where the company has a controlling interest in deposits of bauxite. It is calculated that 3000 to 4000 tons of crude aluminum will be delivered a year.

The plant is partly equipped, the equipment being largely of German manufacture. Dr. Emil Collett and Mr. S. Kloumann, engineer, are the managing directors, with offices in Christiania.

2. A/S Osa Fosse Co., office at Bergen. Mr. Albert Nostrand, Bergen, is the managing director.

This company's plant is in the preparatory stage. The waterfall is 800 meters (meter = 3.28 ft.) high. The falls represent about 80,000 h.p., possibly 100,000; about 40,000 is being developed. The situation is very good, but in cold winters the harbor is closed by ice. The company is closely connected with Bergens Zinc Smelting Company, which will use a small part of the power.

The concern has a working capital of 6,000,000 crowns (\$1,608,000), of which one-half is fully paid.

3. A/S Bremanger Kraftselskab, of which the managing director is Mr. Kristen Faye, Bergen, is capitalized at 3,000,000 crowns (\$804,000). This company's plant is still in the preparatory stages. It is situated close to the sea at Sondfjord, north of Floro, and will have good facilities for ships and all necessary buildings for employees.

The falls, which are 475 meters high, will develop 30,000 h.p. They can be developed for alternating current. It is the intention to manufacture calcium carbide and ferrosilicon and some cyanamid.

Both this company and the one just described expect to have development finished in about three years.

4. A/S Bjolvefossen (at Indre Aalvik, on the Hardangerfjord) is capitalized at 8,500,000 crowns (\$2,278,000), fully paid up. Dr. Thorvald Heiberg, Christiania, is the managing director. The waterfall is about 800 meters high. The company has 20,000 horsepower in use and is developing 44,000. It manufactures carbide and cyanamid. The plant is partially equipped with machinery that has come largely from Germany.

Turbines in electric water power development are obtained from Switzerland and Sweden furnishes other goods, but in the main equipment will have to be obtained from either Germany or the United States. At the present time freights are too high and delivery of goods too slow and uncertain for rapid progress to be made in completing these plants, and after the war it is believed German firms will put forth strenuous efforts to get this trade. Hydro-electric development will doubtless make great strides on the west coast after the war.

SELLING THE ELECTRIC RANGE

BY S. M. KENNEDY, J. F. ROCHE AND A. C. COONRADT

(Policies and methods in the sale of electric ranges are being rapidly formulated as the result of recent experience. This paper summarizes the opinion of several authorities who have been signally successful in building up this class of business. It constitutes a part of the report of the range committee to be presented at the September convention of the Northwest Electric Light and Power Association.—The Editor.)

The electric range has long since emerged from its experimental stage and is now thoroughly practical. It is no longer a luxury but a necessary convenience for the home. Thousands of ranges are installed in progressive households throughout the country. This proves conclusively that the electric range is not only equal but actually superior to any cooking appliance heated by gas, coal or wood and we can tell our customers that the electric range can do anything any other range can do and do it a little better.

The range should be sold at cost plus 15 per cent and a fixed added installation charge. Present statistics seem to warrant an installation charge, except in unusual cases, of \$15, but as a matter of policy a fixed charge of less than \$15 might be advisable. The wiring and installation charge should be included in the range price. The foregoing terms are based on cash sales. We advise a 10 per cent increase where payments are made by installments.

It is obvious that a complete assortment of ranges should be displayed at the office. Wiring should be so arranged that any of the ranges may be connected for demonstration. Each employe in offices where ranges are displayed, should understand intimately the construction and operation of a range so that in cases of emergency they will be qualified to handle a prospect with grace and efficiency. Invitations should be sent to a selected list of customers to witness periodical demonstrations held at the office.

Careful scrutiny should be given all announcements of public or semi-public gatherings, and arrangements made in advance to supply and demonstrate electric ranges on all such occasions. From time to time it is advisable for the company to conduct a cooking school at a location other than the office. Many of the large manufacturers of food products employ traveling demonstrators and arrangements may be made with these demonstrators to use an electric range, thereby making the demonstrations of mutual advantage.

Good prospects for home calls may be obtained from the office records of those who have manifested an interest in the ranges on display in the office.

Competent women demonstrators should be detailed to visit the homes of new range customers immediately after the ranges have been installed. The customer should be impressed with the idea that future demonstrations will gladly be given upon request. Calls should be repeated until it is assured that the operation of the range is thoroughly understood and that it is working satisfactorily.

Co-operation with the electrical contractor dealer is essential. They should be encouraged by allowing them to do the wiring when practical. If dealers are to do the wiring for ranges a set of standard wiring

and installation specifications should be supplied by the central station and sent to all dealers and contractors. These specifications should be strictly adhered to as the range can not operate successfully otherwise.

While it is desirable that we should co-operate with dealers as much as possible, the dealers and contractors should remember that it is the paramount duty of the central station operators to build up their business for the benefit of the stockholders. While the electric range is coming into universal recognition, it is necessary for the central station to assume a large expense for promotion work. Range prices as well as all other materials are advancing rapidly, thus greatly curtailing sales. We believe that for the present central stations must assume the undesirable burden of selling the ranges and in most instances of doing the wiring and installing. As the business develops the time will gradually come when dealers can more profitably take over the range business.

Some one has said, "When destiny can't win a man any other way, she always sends a woman and has never failed to land him." Nothing will win the good will of a woman more quickly than a convenient home equipment, coupled with golden rule service. That kind of things will win the confidence of the woman of the home and obtain her good will, to which the reasonable husband will and must agree. The electric range is the last word in domestic convenience.

UNDERGROUND WATER IN NEVADA DESERTS

In Nevada the bedrock forms a corrugated surface consisting of more or less parallel mountain ranges and broad intervening troughs that are filled to great depths with rock waste washed from the mountains. These great deposits of rock waste were in large part laid down by torrential streams and are relatively coarse and porous. Because these deposits are porous the rain that falls upon them and the run-off that reaches them from the mountains sink into them, and the valleys in which they lie are exceptionally arid. These deposits, however, form huge reservoirs in which the water is stored, and in which, to the limit of the capacity of the reservoirs, it is protected from evaporation.

In a desert valley, even where no wells have been sunk, it is generally possible to ascertain and outline the areas where ground water lies near the surface and to make an intelligent forecast of the depth to water in other parts of the valley. If a sufficient number of observations are made it is also generally possible to form a rough estimate of the quantity of water that is annually available in such a valley and to predict to some extent the capacity of wells, the quantity of the water, and the cost of recovery.

FEEDER DIVERSITY OF ELECTRIC RANGES

BY H. B. PEIRCE

(The effect that a load of electric ranges has on a given lighting feeder is a question of growing importance in the West where electric cooking is receiving such pronounced attention. Here are the results of an investigation on this subject by the assistant commercial agent of the Washington Water Power Company at Spokane that should prove of timely value to commercial agents throughout the West. The article has been prepared for consideration at the Spokane convention of the Northwest Electric Light & Power Association.—The Editor.)

In previous discussions of the Electric Range and its diversity, attention has been principally directed to the diversity or demand factor of a group of ranges with respect to its relation to the income of the central station at the main bus bars.

It will be the purpose of this paper to pay more particular attention to the effect a load of electric ranges has on a given lighting feeder; this is, for the larger cities, the more important question today, particularly so as, in these parts of the country, where hydraulic power is available, it is the primary duty of the engineer to keep down plant investment and as it will be some time before our range peaks cause us to experience station peaks requiring additional investment in generator capacity, it will be more profitable to consider first the problem that immediately confronts us, of having to either provide for heavier feeders or for a larger number of feeders, to handle certain sections where the electric range is threatening to establish the peak of the feeder.

In connection with any such discussion, it will not be out of place to point out what can be done to make the individual feeders more efficient.

To observe the effect of electric ranges on feeders in Spokane, a set of six feeders was selected for special observation. As the city is geographically divided into two sections, north and south, three were selected for each. These were not selected at random but were taken as follows:

- 1st. One heavily loaded with ranges without other distributing power load;
- 2nd. One of medium range density, without other abnormal condition;
- 3rd. A feeder as nearly free from ranges or other power load as could be found.

All of these feeders supply residential districts, with practically no stores or shops to be considered. Each feeder is laid out to handle approximately 100 amperes at 2300 volts single phase. Many, for geographical reasons, have maximum peaks short of this, but this is the amount of peak originally contemplated.

By installing Bristol ammeters and watt-hour meters on each feeder, it was thought data of interest could be secured.

Table No. 1

Feeder Number Location	2543 Brown's Addition	2527 Cannon Hill	2146 Sacred Heart	2140 Natatorium Park	2147 Corbin Park	2531 Gonzaga College
Number of Ranges Peak in Amperes	13	39	13	21	11	6
Saturday 1-13-17	76— 6:00	76— 5:55	81— 6:00	79— 6:05	94— 6:05	23— 5:35
Sunday 1-14-17	66— 6:35	47— 6:30	65— 7:15	66— 5:55	89— 7:05	20— 6:30
Monday 1-15-17	79— 5:35	84— 5:55	86— 5:50	83— 5:40	101— 5:45	25— 5:40
Tuesday 1-16-17	81— 5:40	82— 5:55	87— 5:50	85— 5:35	100— 5:40	23— 5:50
Wednesday 1-17-17	81— 6:00	76— 5:55	89— 6:00	79— 6:05	101— 5:50	24— 5:45
Thursday 1-18-17	81— 5:50	80— 5:55	84— 5:55	83— 6:05	106— 5:40	25— 5:50
Friday 1-19-17	85— 5:45	80— 5:40	90— 6:00	84— 5:45	95— 5:45	32— 5:45
Saturday 1-20-17	81— 5:50	76— 6:00	77— 6:00	82— 5:45	93— 5:55	32— 6:10
Sunday 1-21-17	71— 7:05	59— 6:10	60— 6:45	66— 5:45	71— 5:50	23— 6:00
Monday 1-22-17	85— 5:45	75— 5:50	87— 5:50	83— 5:45	90— 5:35	30— 5:45
Tuesday 1-23-17	82— 5:50	77— 5:05	84— 5:50	84— 5:50	89— 5:55	32— 5:30
Wednesday 1-24-17	81— 5:40	80— 5:50	81— 5:50	79— 5:50	94— 5:45	33— 5:45
Thursday 1-25-17	75— 6:00	75— 6:00	82— 5:50	79— 5:40	87— 7:25	32— 5:45
Friday 1-26-17	78— 5:45	84— 6:00	82— 6:15	80— 5:50	88— 5:45	33— 5:45
Kw.-hr. 1st week.....	12,300	10,800	11,200	11,600	14,800	4,080
Kw.-hr. 2d week.....	11,700	10,850	11,200	11,200	12,400	4,640
Total kw.-hr.....	24,000	21,650	22,400	22,800	27,200	8,720
Load Factor—						
First week	41.6	36.9	35.8	38.2	40.1	36.6
Second week	39.5	37.2	37.0	36.6	37.9	40.4
For two weeks	40.6	37.1	35.8	38.5	36.8	37.9

Table No. 2

Feeder Number Location	2543 Brown's Addition	2527 Cannon Hill	2146 Sacred Heart	2140 Natatorium Park	2147 Corbin Park	2531 Gonzaga College
Number of Ranges Peak in Amperes	13	53	17	25	17	6
Saturday 6- 2-17	51— 8:40	56— 8:30	53— 8:40	95— 8:50	56— 8:50	26— 8:55
Sunday 6- 3-17	44— 9:30	52— 8:55	49— 8:50	79— 8:35	51— 8:50	23— 8:40
Monday 6- 4-17	51— 8:45	53— 8:30	55— 8:30	92— 8:20	55— 8:30	23— 8:15
Tuesday 6- 5-17	49— 8:40	57— 8:50	51— 8:50	94— 8:50	50— 8:50	23— 9:00
Wednesday 6- 6-17	50— 8:50	54— 8:15	54— 8:40	95— 9:05	53— 8:45	26— 8:50
Thursday 6- 7-17	50— 9:10	51— 9:00	51— 8:55	89— 9:00	49— 8:50	23— 9:00
Friday 6- 8-17	47— 8:55	52— 8:45	52— 8:50	91— 8:50	51— 8:50	26— 8:40
Saturday 6- 9-17	46— 9:25	56— 9:10	45— 8:55	92— 8:40	48— 8:55	25— 8:50
Sunday 6-10-17	52— 9:15	50— 8:45	55— 9:10	84— 8:50	52— 8:50	23— 9:00
Monday 6-11-17	51— 8:55	53— 9:10	53— 8:40	97— 8:35	47— 8:30	26— 9:10
Tuesday 6-12-17	47— 9:10	51— 11:50*	47— 9:10	93— 8:50	47— 9:15	24— 9:00
Wednesday 6-13-17	47— 9:15	49— 9:05	50— 8:55	93— 9:00	47— 9:15	23— 9:15
Thursday 6-14-17	44— 9:15	48— 9:00	45— 9:15	92— 8:55	46— 9:20	23— 9:00
Friday 6-15-17	42— 9:15	48— 9:35	40— 9:20	89— 9:20	45— 9:35	22— 9:25
Note.—All time of peak P.M. except * which is A.M.						
Kw.-hr. second week.....	5,440	8,300	7,600	9,200	6,000	2,560
Kw.-hr. first week.....	6,640	9,000	7,600	9,600	6,000	2,560
Total kw.-hr.....	12,080	17,300	15,200	18,800	12,000	5,120
Load Factor—						
First week	36.3	45.4	34.1	27.8	30.7	28.3
Second week	30.2	42.5	39.7	28.5	33.2	28.3
For two weeks	33.4	43.7	34.1	27.9	30.7	28.3

The first set of observations was taken in the middle of winter to determine, if possible, to what extent seasons influenced such load factors. A similar set of readings was again taken in summer, to supplement the first set. The results are shown in Table No. 1 and Table No. 2.

The kilowatt-hours observed are open to question as the instruments were rather large for the purpose, so that too much must not be assumed from the load factors given at the bottom of each column.

It will also be noted that no attempt is made to measure the range demand factor or diversity; this would have been well-nigh impossible and as the effect of ranges on load factor is what is really most interesting, computation of diversity is to a certain extent unnecessary.

The term "load factor" should probably be qualified in this case, as the maximum demands from which the load factors are computed are measured in kilo-volt-amperes and power factor arbitrarily assumed at 90 per cent. But as all of the feeders have approximately equal power factors, and as these results are not to be considered as highly accurate, the load factors given are sufficiently definite for comparison.

It will be noted that feeders with a small number of ranges show decreasing load factors as summer approaches, while the feeders with a larger number of ranges show increasing load factors. One exception would appear to be feeder No. 2140, but as this feeder has an amusement park on it during the summer months, and was considerably altered in the spring, it is not typical.

In order to give more accurate information on the feeders with considerable range load, feeder No. 2527 was further analyzed by being equipped with more accurate recording ammeter and by rectifying the Bristol ammeter charts; on these rectified charts the average daily load has been measured by planimeter and laid off for comparison (see Figures 1, 2, 3, 4, 5, 6 and 7). The characteristics of the feeder are as given below:

Feeder No. 2527.—This feeder supplies a quarter of town located in the southern part of Spokane and made up of small frame houses of an average size of 8 or 9 rooms, with a few large houses and one apartment house, the latter with its eight 6-room apartments, each with electric range, being the largest single consumer on the feeder. The homes are mostly occupied by families of the better grade of office and professional men, the average income probably being about \$2400 per year.

Residence Data

Total number of residences	643
Total number of electric ranges	53
Total capacity connected in ranges	303.3 kw.
Total number of electric water heaters	29
Total capacity, electric water heaters	21.65 kw.
Total number of transformers	44
Total capacity, transformers	437.5 k.v.a.

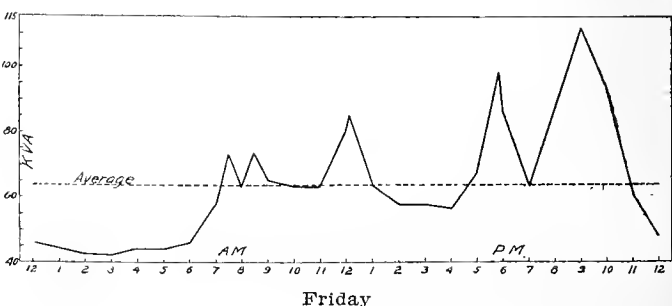
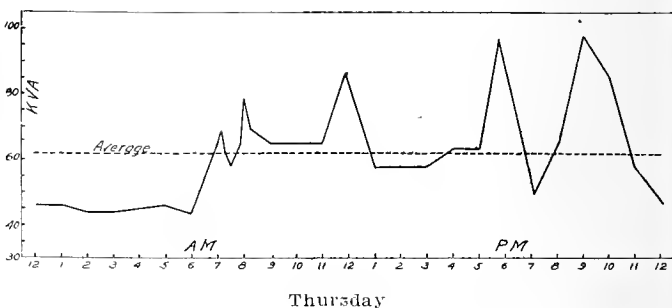
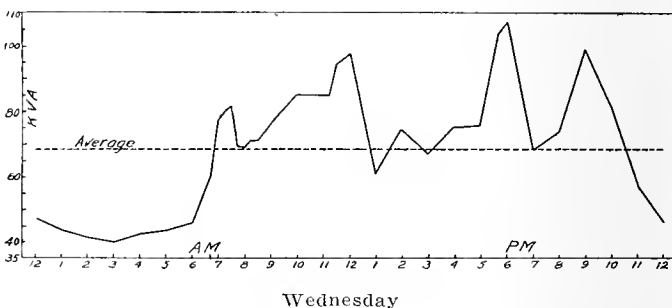
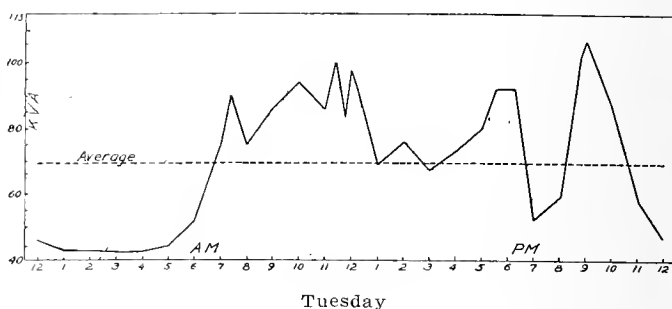
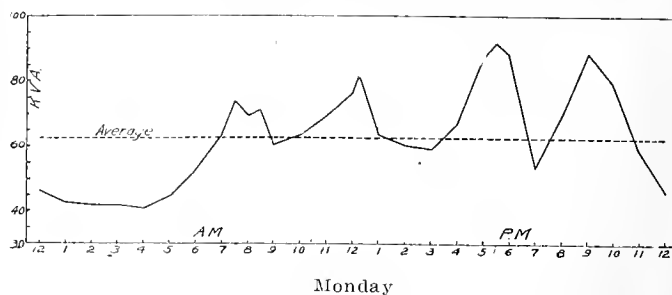
Daily Load Data

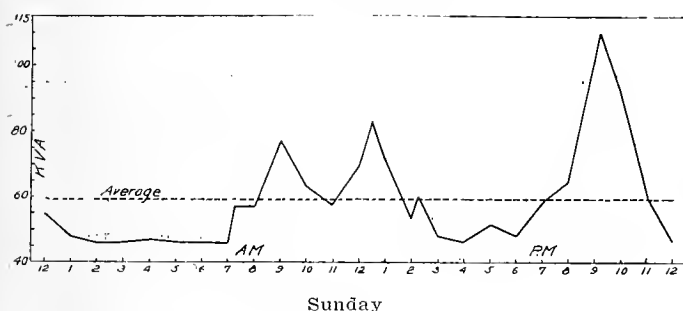
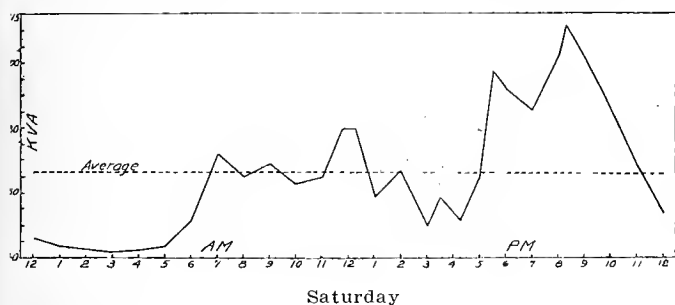
	Average k.v.a.	Maximum k.v.a.
Sunday	59.0	109.7
Monday	62.2	91.7
Tuesday	69.3	107.0
Wednesday	68.4	107.5
Thursday	61.8	97.3
Friday	63.7	111.2
Saturday	66.3	112.0
Average, 64.4.		

Weekly apparent load factor, 57.5 per cent.

It will be noted that it is characteristic of these curves that there is a night load of something over 40

DAILY LOAD CURVES





k.v.a. on every night and that the valley between the 6 o'clock peak and the 9 o'clock peak approaches the same minimum. This can be accounted for by the water heater load which is practically entirely off the range peaks, as each water heater is on a control switch that prevents its being used when the oven of the range is alive. This water heater load, therefore, accounts for over half of the 40 k.v.a.; the balance is made up of all-night lighting and feeder losses, transformer iron losses and meter losses.

Deducting this 20 k.v.a. with an additional 20 k.v.a. for lighting from the largest range peak, 107.5 k.v.a., we get a net range peak of 67.5 k.v.a. at 6:00 p. m. Wednesday which, compared with the connected load of 303.2 k.v.a. in range capacity, gives a demand factor of 4.5, checking with the results formerly secured by the author (see A. I. E. E. Proceedings, August, 1916, page 1213), which would indicate that with 53 ranges, the poorest demand factor probably would be 4.2.

Now to consider the effect of our feeders in the near future.

It is estimated that in a very few years the territory now fed by this one feeder will have six times the present range density, that is, 318 ranges with 1820 k.v.a. connected. Should this be handled by six distinct feeders at present capacity, it is clear that the characteristics of the feeders would be quite similar to those of the feeder now supplying the territory, with the exception that the lighting and ironing peaks would be about 1.6 as large as at present. The annual peak would occur in winter, when the range peak and lighting peak coincide.

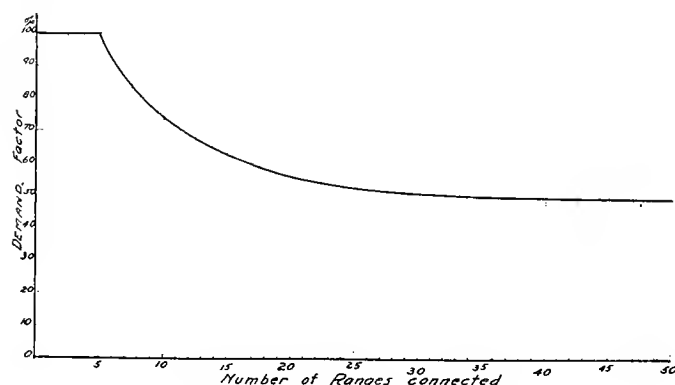
The winter peak for this feeder was 193.2 k.v.a., with 39 electric ranges, which with 3.9 demand factor (see A. I. E. E. Proceedings, August, 1916) would mean a maximum range load of 60 k.v.a., leaving 133.2 k.v.a. for lighting and losses.

Taking one-sixth of this, there will be little improvement in diversity of lighting due to decrease in

number of consumers. We get a lighting and loss load of 22.2 k.v.a. and a superimposed peak of 67.5 k.v.a., due to ranges giving a total of only 89.7 k.v.a. for the annual maximum demand of the feeder, less than half its capacity.

Taking one-third of the district to a feeder, we would have a lighting and losses load of 44.4 k.v.a., which, with a load of 106 ranges of 607 k.v.a. capacity and demand factor 4.7, would be increased by 129.1 k.v.a. to a load of 173.5 k.v.a., which is within the capacity of the feeder.

If we go a step further and use only one additional feeder, we find that our lighting and losses load becomes 66.6 k.v.a. and our 159 ranges, with 910 k.v.a. of capacity and demand factor of 5.2, gives a total peak of 241.6 k.v.a., which a feeder of slightly larger size and only slight additional expense could handle.



The Demand Factor Curve for Determining the Size of Electric Range

In other words, it would appear that while all of our data is still far too inaccurate to make any very definite predictions, still, insofar as feeders are concerned, the excellent diversity of the electric range will make it possible to handle very considerable loads with only slight increases in feeder investment.

MAKING THE DESERTS ACCESSIBLE

In recent years the water supply geologists of the Geological Survey have developed trustworthy methods of located ground water in arid regions from surface indications and estimating the depth to water and the approximate annual yield of the underground reservoir. These methods will be applied and further developed in connection with the survey of desert watering places.

FUEL CALORIMETER TABLES

A new publication of the Bureau of Standards, (Circular No. 65) entitled "Gas Calorimeter Tables," has just made its appearance.

This circular may be regarded as a supplement to Bureau of Standards Circular No. 48, "Standard Methods of Gas Testing." The correction tables are arranged in a sequence most convenient for use in connection with the proposed record sheet. The record forms for calorimeter tests which are shown in the circular have been used for some time and found to be complete and convenient. It is hoped that these forms will be adopted wherever possible so that there will be greater uniformity in operating methods and the records used.

FUEL OIL AND STEAM ENGINEERING

(Simple rules for the putting in and putting out of boilers are matters of much convenience and importance in fuel oil practice. Here is a discussion that first sets forth the preliminary precautions necessary to be taken by the engineer, then the method to be employed in connecting up boiler units is given. The discussion closes with the description of a method for the removal of the sediment, how to keep out cylinder oil, how to cool and clean the boiler, and finally how the boiler is put out of service. —The Editor.)

BOILER ROOM INSTRUCTIONS FOR FUEL OIL BURNING

BY ROBERT SIBLEY AND CHAS. H. DELANY

Many fatal accidents both to life and property have happened due to foolhardy methods in design and operation of the steam boiler. This early became so apparent that rigid governmental inspection of boiler operation was insisted upon. To aid in sys-



AN INSPECTOR'S TESTING AND PROVING OUTFIT
Here is a typical outfit for boiler and power plant inspectors. It consists of a standard test gauge, a screw test pump, a gauge hand puller, a hand set and other useful conveniences.

tematic inspection the Department of Commerce and Labor at Washington has issued general rules and regulations for such supervision under Form 801 entitled Steamboat Inspection Service. Many insurance companies have, too, put into force rigid rules of inspection to safeguard their interests in assuming risks. The most complete publication on the subject, however, is to be found in the recently published report of the Boiler Code Committee of the American Society of Mechanical Engineers, entitled: "Rules for the Construction of Stationary Boilers and for Allowable Working Pressure." These rules have been adopted by law in a number of States, including California where they have been incorporated in the Safety Orders of the State Accident Commission.

In the discussion taken up in this chapter only fundamentals will be considered. The thorough mastering of these fundamentals will, however, enable the reader to understandingly read the deeper discussions alluded to above.

The Inspection Tests Involved.—The testing of the water and steam gages, the checking of fittings and appliances, and the trying out of the safety valves and other accessories constitute, of course, important details of boiler inspection. The most important feature, however, is to ascertain by computation the maximum allowable working pressure that may be safely put upon the boiler. After this maximum allowable pressure is ascertained the boiler is subjected to a hydrostatic pressure test by filling the boiler completely with water and then pumping enough additional water into it to raise the pressure to the desired point. This apparatus is held under proper control and the total pressure put upon the boiler is one and one-half times the maximum allowable working pressure.

Thus if the maximum allowable working pressure on a boiler is 160 lbs. per square inch above the atmosphere, the test pressure to be applied should be 240 lbs. per square inch.

Many carefully compiled instructions have from time to time been issued by various boiler makers, inspectors, and others interested in economic and safe operation. The instructions compiled by J. B. Warner, chief inspector of the San Francisco department of the Hartford Steam Boiler Inspection and Insurance Company are especially good, and largely the ideas appearing in the following lines come from this source:

Preliminary Precautions.—Whenever going on duty in the boiler room, find out, first of all, where the water level is in the boilers. Never lower nor replenish the fires until this is done. Make sure that the gage glass and gage cocks, and all the connections thereto, are free and in good working order. Do not rely upon the glass altogether, but use the gage cocks also, and try them all, several times a day.

Before starting up the fires, open each door about the setting and look carefully for leaks. If leaks are discovered, either then or at any other time, they should be located and repaired; but cool the boiler off first. If leaking occurs at the fore and aft joints, the inspecting company should be notified at once. This is important, whether the attendant considers the leakage serious or not; and it is especially important when the boiler has a single bottom sheet, or is of the two-sheet type.

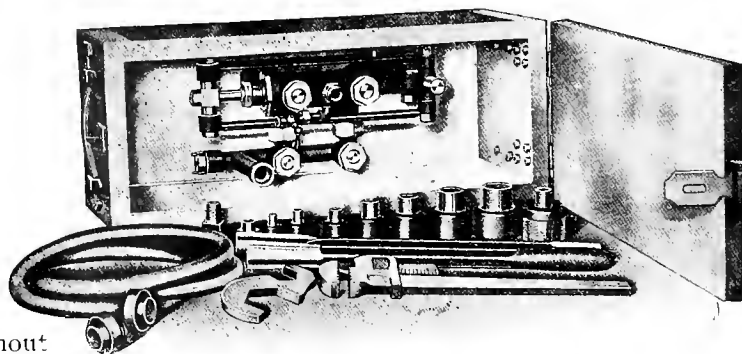
When a boiler has been emptied of water, do not fill it again until it has become cold.

In preparing to get up steam after the boiler has been out of service, be sure that the manhole and handhole joints are tight. Do not use gaskets that are thin and hard.

Vent the boiler in some way, first, to permit the escape of air. Then fill the boiler to the proper level, open the dampers, and start the fires. Start them early so as to have the pressure up at the required hour, without forcing.

Ventilate the setting thoroughly before lighting the fire. Never turn on the fuel supply when starting up without first placing in the furnace a lighted torch or a piece of burning waste to ignite the fuel instantly.

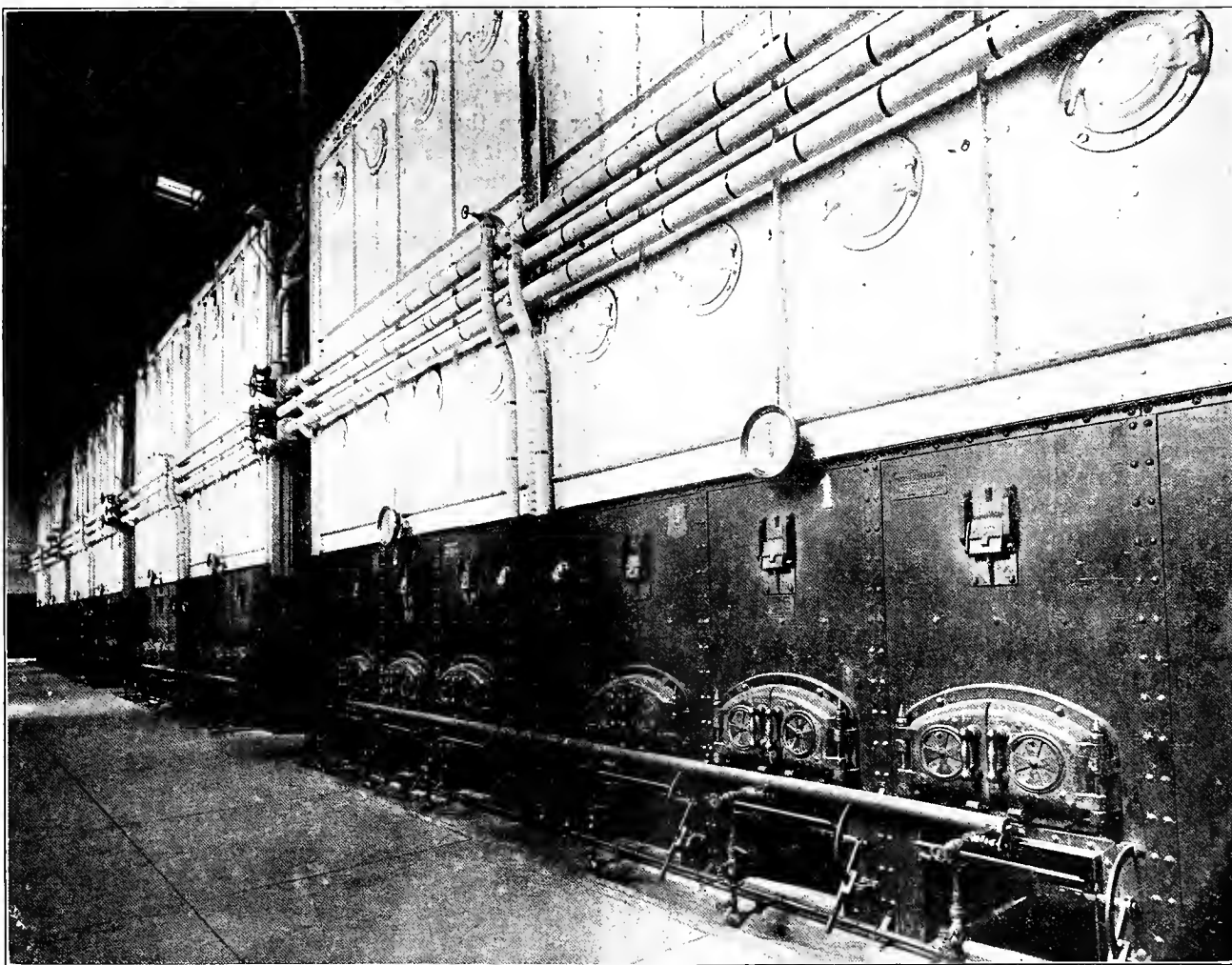
Connecting up Boiler Units.—In firing up a boiler that is to be connected with others that are already in service, keep its stop-valve closed until the pressure within the boiler has become exactly equal to that in the steam main. Then open the stop valve a bare crack, and slowly increase the opening until the valve



A PORTABLE BOILER TEST PUMP

After the maximum allowable working steam pressure for the boiler has been computed, the boiler is then submitted to a hydrostatic test of one and one-half times this allowable pressure. The above apparatus is especially adapted for those having frequent occasion to make hydrostatic tests of boilers.

is wide open. The complete operation should occupy two minutes or more. Close the valve at once if there is the slightest evidence of any unusual jar or disturbance about the boiler. See that the steam main to which the boiler is to be connected is thoroughly drained before the valve is opened.



TYPICAL BOILER FRONT WITH AUTOMATIC REGULATOR

Here may be seen a recent improved system for regulating the fuel that is fed to the boiler furnaces. The installation is that of the Inspiration Copper Company's plant, described in the Journal of Electricity, August 15, 1917, page 149. The oil supply is controlled from one central point, and with it, the steam used, in atomizing the oil and the quantity of air admitted to the furnace are also under delicate control. Any fluctuation in steam pressure operates a governor whose power arm controls a bleeder valve on the oil pump discharge line thus cutting off the oil supply, if the steam pressure is too high and reducing it, if too low. Any change in pressure in the oil main, in turn, controls the amount of steam for atomizing and of air for burning the oil.

Low Water Encountered.—In case of low water, immediately shut off the oil supply at the burners. Do not turn on the feed under any circumstances, and do not open the safety-valve nor tamper with it in any way. Let the steam outlets remain as they are. Get your boiler cool before you do anything else.

Avoid Making Repairs Under Pressure.—No repairs of any kind should be made, either to boilers or to piping, while the part upon which the work is to be done is under pressure. This applies to calking, to tightening up bolts under pressure, and to repairs of any kind whatsoever.

The safety-valve must not be set at a pressure higher than that permitted by the insurance company's policy. Try all safety-valves cautiously, every day. If the actual blowing pressure, as shown by the gage, exceeds the pressure at which the valve is supposed to blow, inform the office immediately, so that prompt notice may be sent to the company. The safety-valve pipe should never have a stop-valve upon it.

Removal of Sediment.—To remove sediment from the bottom of the boiler, open the blowoff valve in the morning, or before the circulation has started up. The valve should be opened wide for a few moments, but it should be opened and closed slowly, so as to avoid shocks from water-hammer action. When surface blowoffs are used, they should be opened frequently, for a few minutes at a time.

In case of foaming, check the draft and shut off the burners. Shut the stop-valve long enough to find the true level of the water. If this is sufficiently high, blow down some of the water in the boiler, and feed in some fresh. Repeat this several times if necessary. If the foaming does not stop, cool the boiler off, empty it, and find out the cause of the trouble.

Keep Out Cylinder Oil.—Cylinder oil must be kept out of the boilers, because it is likely to cause overheating of the plates. Oily deposits may be removed, in large measure, by scraping and scrubbing, although more efficient methods of treatment may be required in bad cases. If kerosene is used in a boiler, keep all open lights away from the manholes and handholes, both when applying the kerosene, and upon opening the boiler up afterwards; and ventilate the inside of the boiler thoroughly, after oil has been used in it.

Fusible plugs should be filled with pure tin. They should be renewed or refilled as often as may be necessary to keep them in good condition.

Cooling and Cleaning the Boiler.—In cooling a boiler before emptying it, first let the fire die out, and then close all doors and leave the damper open until the pressure falls to the point at which it is desired to blow. Clean the furnace and let the brickwork cool for at least two hours before opening the blowoff valve. If it is desired to cool the boiler further, after it has been emptied open the manhole and leave everything else as in full actual service—the fire doors, front connection doors, and cleaning doors being closed, and the damper and ash-pit doors open.

First cool the boiler as explained in the last paragraph. Never blow out under a pressure exceeding ten or (at most) fifteen pounds by the gage.

The engineer must find out for himself how often his boilers need to be opened and cleaned. In many plants it is necessary to clean every week, while in some favored few it is sufficient to clean every three months. When using kerosene or large amounts of scale solvent, or when (as in the spring-time) the water becomes unusually soft, the boilers must be opened oftener than usual. In washing out a boiler, wash the tubes from above, as well as from below.

Never touch any valve whatsoever, in any part of the room, while a man is inside of a boiler, nor even after he has come out again, until he has reported that his work is finished and that he will not enter the boiler again. It is well to lock the stop-valve and blowoff valve upon every boiler in which a man is working, while other boilers are under steam. Padlocks and chains may be used for this purpose.

In water-tube boilers the covers opposite the three rows of tubes nearest the fire should be taken off once a month, and the tubes thoroughly scraped and washed out; and all the tubes should be thoroughly scraped and washed out at least once in four months. This is for water of average quality. If the water is bad, clean the tubes oftener.

When mechanical hammers or cleaners are employed for removing scale from tubes, the pressure used to operate them should be as low as will suffice to do the work. Do not allow the cleaner to operate for more than a few seconds upon any one spot, and see that it goes entirely through the tube. Avoid high temperatures in the steam or water used to operate the cleaner.

Putting Boiler Out of Service.—In putting a boiler out of service, it should be cooled, emptied, and thoroughly cleaned, both inside and outside. The setting should likewise be cleaned in all its parts. Leave the handhole covers and manhole plates off. After washing the interior of the boiler, let it drain well. Then see that so moisture can collect anywhere about the boiler, nor drip upon it either internally or externally. Empty the siphon below the steam gage if the boiler room is likely to be cold, or take the gage off and store it safely away.

Do not allow moisture to come in contact with the outside of the boiler at any time, either from leaky joints or otherwise. Keep the mud drums and hipples, and the rear ends of horizontal and inclined tubes in water-tube boilers, free from sooty matter. If internal corrosion is discovered, notify your employers at once.

Examine your boilers carefully in all their parts, whenever they are laid off, and keep them as clean as possible, both inside and outside. See that all necessary repairs are made promptly and thoroughly. Keep the water glass and pressure gage clean and well lighted. If any contingency arises that you do not understand, report the matter to your employers at once; and if you think it possible that serious trouble may be impending at any time, shut down the boiler immediately.

Inform yourself respecting any local laws or ordinances relating to the duties of engineers and firemen, or to the plant in which you work. If there be any such, attend to them faithfully.

SPARKS—Current Facts, Figures and Fancy

(A spark is a brilliant flash of light that is often observable when gigantic electrical energies are brought into play. Here are sparks emanating from the energies of a gigantic industry that may perhaps serve to give you a new thought or add new inspiration to the work you have at hand.—The Editor.)

The annual price paid for street lamps in a number of prominent cities of the nation is as follows: Seattle, \$80 per arc lamp per year; Portland, \$51.60; Butte, \$61; Chicago, \$75; Spokane, \$48; San Francisco, \$67.50, and Buffalo, two plants average \$63.

* * *

Between the rails of a railroad there are, ordinarily, just four feet eight inches and a half, and the balance of the unsafe space does not exceed three feet; yet with all the rest of the world to stand and walk on, some 11,000 people every year find it necessary to their employment to end their days or their health, on this narrow strip of land.

* * *

The general public in America can draw some satisfaction that at least increases in electric traction rates is not proposed to the extent of recent orders in Russia where the Provisional government at Moscow has decided to increase passenger tariffs on the railroads 50 per cent and freight tariffs 200 per cent.

* * *

Some recent patents of Dr. Nernst relate to arcs struck between carbon electrodes in atmospheres of zinc, aluminium and titanium chloride. The latter appears to be specially suitable for the object in view. The efficiency obtained in such lamps is said to be similar to that obtained with mercury vapor lamps. A resistance in series with the arc is utilized to volatilize the salt used.

* * *

"Mrs. Frank J. Kerns used her automatic electric range to hatch chickens last week," so reports A. P. Tills, the commercial manager of the Northern Idaho & Montana Power Company. "Old mother hen refused to set longer on the eggs on account of the extreme hot weather. Mrs. Kerns immediately transferred the eggs from the nest to the oven on her electric range and to her surprise the next morning she had 14 little chicks. All are alive and doing well."

* * *

According to The Illuminating Engineer a new style of street light has been inaugurated in a Texas town which consists in placing a 100 watt lamp in an opal globe under the awning of each shop entrance. It was agreed that the system would not be applied to any block unless the entire block was uniformly lighted. About 400 lamps have already been installed, and it is stated that a good effect on the window lighting has also been produced, quite a number of prominent stores taking the opportunity to bring their illumination up to date.

* * *

Gas has been furnished at 7 and $7\frac{1}{2}$ Dutch cents (2.8 and 3 American cents) per cubic meter (cubic

meter = 35.3 cubic feet), but it is found that the actual cost of production is more than the charge to consumers. Therefore the price will be advanced to 10 and $10\frac{1}{2}$ Dutch cents (4 and 4.2 American) per cubic meter.

* * *

The enthusiast in the safety movement, according to the Bureau of Safety, is he who knows he is working along the broad, humanitarian lines. He is aware that safety does not consist of a few speeches, a splurge of ink, and a moving picture show. These things help, but they alone will not suffice to pull men from the careless "danger habit" of years. That takes time, thought and constant effort. Above all, it must be considered that when indifference comes in at the front door, safety flies out the window. This fact makes plain the need for constructive enthusiasm, which is simply enthusiasm plus brains.

* * *

As indicative of the increasing friendliness and world-wide wholesome respect for the new engineering ideals of America, comment from a recent editorial of the Electrical Review of London is most interesting: "We need not follow the details of the new organization, our aim is to focus attention upon the vast movements in progress in the United States, the complete change of attitude towards the rest of the world, the adoption of new ideas and motives of action, as typified in these great movements in engineering circles, and to suggest again that there is a lesson to be learned by us from them."

* * *

An engineering journal, speaking on contraction and expansion caused by the cold and heat gives the following interesting facts: The Brooklyn Bridge is twelve inches longer at 3 p. m. on a hot day than it is twelve hours later; the Eiffel Tower is eight inches higher in summer than in winter. The Washington Monument at Washington increases its height about two inches on a hot day; a battleship is more than six inches shorter in winter than in summer and an ironclad in the tropics is nearly a foot longer than her sister ship in a northern sea.

* * *

Prehistoric irrigation is now known to have existed upon the Mesa Verde National Park Reservation. What is known as Mummy Lake was never properly a lake, but a reservoir for prehistoric irrigation. The surrounding region was doubtless well farmed. The remains of the ancient ditches indicate a considerable activity, according to Dr. J. Walter Fewkes of the Smithsonian Institution. To date, however, no evidence of the electrically operated pump seems to have been uncovered.

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CONTENTS

Electricity at the Bunker Hill & Sullivan. By A. H. Halloran	247
A New Record for Power Transmission.....	254
Some Aphorisms of the Trade. By J. C. Ralston.....	255
High Lights in Central Station Salesmanship. By L. A. McArthur	257
Low Power Rates in Canada.....	258
The Engineer and the Commercial Department. By D. F. Henderson, L. T. Merwin, J. L. Duffy, J. C. Henkle, and A. S. Hall	259
Central Station Enlists Housewives in Food Preservation....	261
Central Station Co-operation with Architect and Contractor. By A. C. McMicken	262
Recent Progress in Electric Water Heating. By A. Strauch, L. R. Grand and R. A. Wilson.....	264
Comparative Tests of Cooking by Fuel and Electricity. By B. L. Steele	267
Water Power Development in Norway.....	269
Selling the Electric Range. By S. M. Kennedy, J. F. Roche, and A. C. Coonradt.....	270
Underground Water in Nevada Deserts.....	271
Feeder Diversity of Electric Ranges. By H. B. Peirce.....	273
Making the Deserts Accessible.....	273
Boiler Room Instructions for Fuel Oil Burning. By Robert Sibley and Chas. H. Delany.....	274
Sparks—Current Facts, Figures and Fancy.....	277
Editorials	278
The Contractor and Dealer.	
New Opportunities for Women.	
Progress in Railway Electrification.	
The Financial Status of the West.	
The Value in the Junk Heap.	
The New Journal Service.....	280
Personals	281
Meeting Notices for Electrical Men.....	283
Builders of the West XII. John M. Eshleman and Max Thelen	283
Latest in Everything Electrical.....	287
New Bulletins	289
What Western Inventors are Doing.....	290
New Electrical Developments.....	291

THE TEST OF PATRIOTIC SINCERITY

The Romans built massive cities of marble.

The more excellent of the marble structures were perfect and form fitting.

Those which were not perfect and form fitting were filled with wax to make them look perfect.

In time the perfect building became known as *sine cera*—without wax.

In our patriotic service for the nation, for our company and for each individual self, would it not be an excellent idea to examine our motives, as the old Romans examined their buildings, and see if they can in all cases pass this test of *sine cera* or, in the modern use of the word, to see if our motives, from the innermost analysis are in fact at all times *sincere*.

The splendid results attained at the recent Santa Cruz convention of the California Association of Electrical Contractors and Dealers, coupled with the enthusiasm that is being shown in the forthcoming September gatherings of contractors and dealers in British Columbia, Washington and Oregon, point to but one conclusion—the unquestioned success of co-operative effort of this character.

The annual sales possibilities of the electrical industry as a whole reach almost inconceivable figures. The present sales approximate \$700,000,000. What is then the most practical way of doubling this volume in advance of the normal growth and at the same time developing a stable, healthy, profitable situation in all branches of our industry? This is the problem not only before men of the industry in the West but throughout the entire nation.

To undertake this task an organized industry is required. Is our industry organized? In certain branches, yes; for example, the central stations and the jobbers have efficient, strong organizations.

Lack of proper retail distribution is one of the millstones about the neck of the industry. There are perhaps 25,000 concerns now engaged in retailing electrical merchandise, but, because of improper methods and in fact ills of many descriptions, many of these concerns are financially weak. Failures have been innumerable and they will continue with all that it means to those concerned until the dealer arouses himself from his lethargy and does his part.

The question of retail distribution must be solved or the present most unsatisfactory conditions to all the branches of the industry will continue.

The retailers, which comprise contractors and

dealers, need, therefore, a good strong organization comprising national, state and local sections. Such organizations can develop healthy growth in the industry beyond the normal growth and all the while they will be able to produce profit to the interests participating. This is the goal for which every well-wisher of the electrical industry is striving. Lining up the industry on the basis of what it means to each individual should appeal at this time as a movement deserving the hearty support of all.

There are in the main two methods by which the industry in the West can be vastly forwarded. First, the continued hearty and systematic support of broad-minded technical journals that are now doing such efficient work in spreading the gospel of co-operation throughout every nook and corner of the electrical industry, and second, a more earnest and systematic gathering into the local, state and national associations of all contractors and dealers that are actively engaged in business at the present time.

With these two weapons used to their highest and most impersonal value, directed solely for the benefit of the industry as a whole, there will result a constructive and commercial success beyond the fondest dreams of those looking toward the betterment of the industry throughout the nation.

It is difficult to estimate the future possibilities of women in the electrical industry and other vocational opportunities throughout the West. Editorial comment was made in the *Journal of Electricity* for June 1, 1917, page 455, relative to the almost unbelievable activities that women are performing in the electrical industry in England at the present time.

The constant trend in evolution of vocational opportunities for woman, serving to broaden her field of endeavor, combined with the new tasks that must perforce be performed by her, due to the exigencies of the present world crises, make her scope of activity one of unique opportunity.

It is with unusual pleasure that the publishers of the *Journal of Electricity* announce to its readers that in the future its columns will be devoted to a new departure in technical journalism. A department devoted to the opportunities for woman and the part she is to play in the great engineering and industrial development of the future will be headed by Miss Clotilde Grunsky, medalist of the class of 1914 at the University of California and daughter of C. E. Grunsky, one of the best known consulting engineers of the nation. Miss Grunsky's entire time will be devoted to the activities of the *Journal of Electricity* in the capacity of Associate Editor.

Since graduation, her nationwide research investigation of vocational opportunities for women has gained for her an enviable recognition as an authority on problems connected with women in the industries. Her editorial writings on these subjects, combined with her helpful lectures before the young women students at Mills College during the past year, have proven exceptionally marked.

The *Journal of Electricity* and its publishers bespeak for her in this new departure in technical journalism the kindly assistance, and loyal support of its readers that have been given so generously to all of its former activities since the initiatory days of its publication—thirty years ago.

Ever since the electrification of the St. Paul Pass has been completed and put into successful operation in Montana and Idaho, engineers of the West have watched with intense interest the after developments that would follow due partially to the rapid trend of economic evolution in the art of electrification of railways but more especially due to the insistent demand on the part of the public.

That the St. Paul has under way the electrification of its line through the last of the great mountain ranges hardly a year after completion of its first zone is regarded among railway men as confirming the wisdom of the St. Paul management in this undertaking.

The St. Paul will spend several millions in the Cascades. The electrification from Othello, Wash., to Seattle and Tacoma will add 211 miles to the electric lines, making a total of 651 miles under operation from mountain water-generated power. This gives the St. Paul, in addition to being one of the longest railway systems, the distinction of being the longest electric railway in the United States and probably in the world.

Eight substations will be built in the new zone for delivery of the current to the railway, located at Taunton, Doris, Kittitas, Hyak, the east portal of the Snoqualmie tunnel, Cedar Falls, Black River junction and the Tacoma shops.

The continued glowing reports from all those who have traversed the mountain passes of the West over this superbly electrified road lead thoughtful men to two conclusions—that railway electrification over the mountain passes has come to stay and that the real question is how best to finance undertakings of such gigantic proportions so that electrification may receive universal application throughout this section of the country.

Upon the financial stability of the West much depends for future industrial and commercial development, especially in hydroelectric activity. It is intensely gratifying to all well-wishers of the West to note the increasing share of financial responsibility that is being borne by the financial institutions of this section.

It is well-known that the engineering and commercial future of the countries bordering the great Pacific Area will look to America for an increasing support in enterprises of internal development. This conclusion is forcefully set forth in a recent report by P. S. Smith, a special agent of the Bureau of Foreign and Domestic Commerce who is in South America investigating opportunities for trade with our Latin American neighbors in electrical goods. In his report Mr. Smith states that if any big development

New Opportunities for Women

Progress in Railway Electrification

The Financial Status of the West

in our electrical export trade is to take place on the west coast of South America it will come as a result of the investment of American capital in mines, railways, electric companies and general mercantile stores, which will be truly American selling agencies, and not jobbers who pretend to handle American goods but in reality hold agencies for manufacturers in the states while making attempts to sell only the products of other countries. It is well known that vast opportunities exist in these countries and increasing strength of financial institutions in the West speaks well for future engineering enterprises of this nature.

Especially is the growth of the acceptance plan among banking institutions of the West to be noted with extreme satisfaction.

As an instance of growth of this nature the banking institutions of San Francisco may well be cited. A year ago the clearings of these banks reached what was then thought to be a wonderful showing in that the ten million dollar mark was passed as compared with the previous exposition year in which seven and three quarter millions had been reached. Today however, the daily clearings exceed thirteen and one-half millions of dollars. Repeatedly, the lead of San Francisco banks among the great financial institutions of the United States has been pointed out in the financial papers of the country. In the nation's honor roll of banks dealing in acceptances another illustration is afforded of the progressive spirit animating the big money changing houses of this city. In a compilation of the ninety banks and trust companies doing the largest acceptance business as of June 20, just completed, San Francisco is represented by five banks, the Anglo and London Paris in twelfth place with outstanding acceptances of \$7,461,141, the Crocker National in twenty-sixth with \$2,175,829, Bank of California in twenty-seventh with \$2,055,489, Wells, Fargo Nevada in sixtieth with \$347,777 and First National in seventieth with acceptances of \$231,268. Rated according to percentage of outstanding acceptances to capital and surplus, the Anglo and London Paris is placed first among all the banks in the United States dealing in acceptances, while the Crocker ranks twentieth, California fifty-ninth, First National seventy-sixth and Wells Fargo eightieth.

Such banking institutions as these which are daily growing in strength throughout the West mean much for the future commercial and engineering activity of the great Pacific Area.

In the Journal of Electricity for May 1, 1917, on page 363, comment was made on the fact that five million empty five-gallon oil cans had been recently shipped to the Orient from Seattle as junk and the suggestion was there made that American enterprise should awaken to the value of the junk heap generally and put to profitable advantage the enormous waste contained in the annual junk heap in America that proves of practically no profitable return.

The Value in the Junk Heap

It is interesting to recite some of the uses to which junk tin of the nature above mentioned is put by the Oriental tradesmen according to information collected by the department of commerce.

The tin shops purchase them for making all kinds of household utensils—lamps, cookstoves, pots, pans, sprinklers, small pumps (for pumping oil out of full tins), and innumerable other articles. The kerosene tin is used as a biscuit display box by removing one face and substituting glass; a new top is affixed and it becomes a rice container; it is cut diagonally into two parts to make two dustpans. Without alteration tins are used as camphor-oil, lime, alcohol, and molasses containers.

While America is known throughout the world as a nation of intense activity and inventive genius, still the gigantic waste observable on all sides is a source of shock to the foreign observer.

It is well in these days of industrial tensivity due to the straining of every nerve for increased production that the prodigious wastes in paper, boxing, tin, wrapping clothes and discarded machinery be carefully gone over with the eye for waste prevention and good is bound to result.

One great railway in the West is said to have realized recently over a half million dollars from the sale of junk iron. Perhaps the waste copper and other valuables in discarded electric appliances might well pay the contractor and dealer for ferreting out among their customer list.

Let every reader who peruses this line endeavor to save some of the former waste of which he is familiar either at home or in the office—and then think of the gigantic total that could be accomplished by the combined effort of a hundred million people in the saving of the annual national junk heap, hitherto abandoned.

THE NEW JOURNAL SERVICE: Acting upon the principle that "we profit as we serve" the Journal of Electricity will inaugurate a new and unique institution in technical journalism with its October first issue. During the past months we have been receiving increasing calls for men to fill high salaried positions. So much so that it has been impossible to secure sufficient information on applicants to meet the particular demands of each case. In view of this fact a service department will be opened at an early date to meet this long felt want. Central station managers and others having positions open are urged to make known their wants to the editorial department of the Journal. This information will in all cases be considered confidential. The names of such of our paid subscribers, who so desire, will then be given to those having the positions to fill and the files containing information in behalf of the applicants placed at their disposal. This service is to be founded solely with the purpose in view of building up the usefulness of the Journal of Electricity which is now rapidly winning its way into every phase of the electrical industry in the West. From those applicants who are successful only a nominal fee will be asked, such in fact as will bear only the actual expenses involved in carrying on the work. The service of this department will, however, be available to only those who are paid subscribers of the Journal of Electricity.

PERSONALS

M. C. Osborn, commercial agent of the Washington Water Power Company, and president of the Northwest Electric



Light & Power Association, is making good in every detail of the work that is before him in directing the task of preparation for the largest and most enthusiastic convention ever held by his association, which is to take place in Spokane, Sept. 12-15, 1917. As an instance of his foresight and thoughtfulness a quotation from a recent letter to the Journal of Electricity is as follows: "Concerning the special car from California, as

soon as you know the number of people coming I would like to be advised whether or not you wish to have me make hotel reservations or whether you intend to have your lodgings in the car. We wish to make special efforts for the comfort and entertainment of the California delegates. It is rather too early to predict but it looks now as though we were going to have the largest attendance in the history of the association." All well wishers of the West are back of Mr. Osborn in his efforts to put over this task and as a consequence a splendid and enthusiastic gathering is bound to result.

W. H. P. Hill, formerly with the Northwestern Electric Company, is now sales manager of the Idaho Power Company.

E. Okawara, director of the Tokyo Gas Company, of Tokyo, Japan, is making a tour of inspection of gas industries in the United States.

A. K. Baylor, of the General Electric Company's staff in New York City, is expected on the Pacific Coast during the latter part of September.

C. B. Wirt has been transferred from the Seattle office to the Portland office of the Westinghouse Electric Manufacturing Company, in the sales department.

C. D. Monteith, now with the Missoula Light & Water Company of Missoula, Mont., but formerly with the Northwestern Electric Company of Portland, is a recent Portland visitor.

J. T. Whittlesey, general manager of the Universal Electric and Gas Company of San Francisco, is now comfortably settled with his company force in the new headquarters at 469 Sutter Street.

J. J. Wood, chief engineer of the Fort Wayne Electric Works of the General Electric Company, is a recent San Francisco visitor and has left for a visit to the Yosemite Valley. Mr. Wood is the inventor of the historic Wood-arc machine.

L. A. Knott, manager of the San Francisco office of the Sangamo Electric Company, is back again in San Francisco after an interesting and profitable trip through the principal cities of Southern California.

J. S. Shell, formerly in the commercial department of the Portland Railway, Light and Power Company, is now a captain in the U. S. Quartermaster's Department, stationed at Fort Sam Houston, Texas.

Girard B. Rosenblatt, engineer in charge, mining division, Westinghouse Electric and Manufacturing Company at Salt

Lake City, Utah, has been transferred to the grade of member in the American Institute of Electrical Engineers.

J. C. Zancker, northwestern representative of the Federal Sign System (Electric) has returned to Portland from a trip to Vancouver, B. C., where he attended a recent gathering of power men composed of men interested in this industry living in Western Canada.

H. N. Keifer, formerly district engineer for the Northern Electric Co., Vancouver, B. C., has returned to Vancouver after having spent several months in New York and has opened an office in the Standard Bank Building, where he will carry on a consulting and general engineering business.

Clotilde Grunsky, daughter of C. E. Grunsky, the well-known consulting engineer, will join the editorial staff of the Journal of Electricity on October 1, in the capacity of associate editor, and in charge of social service and welfare work. Further interesting announcements regarding her future activities with the Journal of Electricity will be found on the editorial page.

C. O. Poole, chief engineer Nevada-California Power Company and Southern Sierra Power Company of Riverside, California; **J. G. Scrugham**, state engineer for Nevada; **L. M. Klauber**, superintendent of the electrical department for the San Diego Consolidated Gas & Electric Company, and **H. A. Barre** and **R. E. Cunningham**, superintendent of electrical distribution for the Southern California Edison Company of Los Angeles, were at San Francisco during the past week attending a meeting of the engineering committee of the Pacific Coast Section N. E. L. A., called by Chairman **J. E. Woodbridge**. Local men in attendance included **S. J. Lisberger** and **J. P. Jollyman** of the Pacific Gas & Electric Company, and **John A. Koontz** of the Great Western Power Company.

Captain David T. Mason, formerly professor of forestry at the University of California now with the battalion of foresters of the engineer regiments of the United States Army, is in Washington, D. C., and expects to leave for France at an early date. Mr. Mason spent several years in Forest Service in the mountains of Montana with headquarters at Missoula before undertaking work in the faculty at the university. His long practical experience and high standing in educational circles make him an unusually valuable man in the work he expects to undertake in France at an early date.



OBITUARY

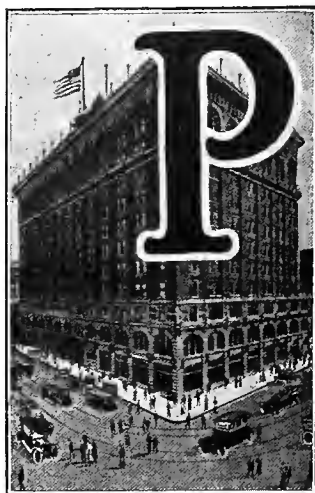
Ernest Haughton, manager of the Chicago Bryan-Marsh division of the National Lamp Works, was killed, with Mrs. Haughton, Wednesday night, Aug. 22, while driving by automobile from Association Island to Paul Smith's in the Adirondacks.

Mr. Haughton was a member of a number of engineering and civic organizations and took great pride in service to his fellow men. He was a prominent advocate of many of the extraordinary movements adopted by the National Lamp Works in behalf of employees and his interest in their welfare never abated. He was an honored and trusted executive of their savings association and a director of the trust fund created for the investment of these savings. Two children survive Mr. and Mrs. Haughton, Julia, aged 11, and Ernestine, aged 5. The funeral was held in Henderson, Ky., on Monday, August 25, and memorial services held at the East Cleveland, Ohio, Presbyterian Church.

MEETING NOTICES FOR ELECTRICAL MEN

(As this issue of the Journal of Electricity goes to press the most favorable prospective reports from the coming conventions are heard on all sides. The Northwest Electric Light & Power Association at Spokane, the Pacific Coast Gas Association at Santa Cruz, and the various associations of contractors and dealers in Washington, Oregon and British Columbia all have before them splendid convention programs, covering topics of timely interest to men of the industry throughout the West. Considering the serious character of the times these gatherings will all be unusually well attended. In the following lines will be found briefs concerning these and other meetings of electrical men in various sections of the West during the current month.—The Editor.)

SYNOPSIS OF N. W. ASSOCIATION CONVENTION PROGRAM



Hotel Davenport, the Convention Headquarters

RESIDENT M. C. Osborn will call the convention to order at 10:30 a. m., Wednesday, Sept. 12th, in the Hall of the Doges, Hotel Davenport, Spokane. After an address of welcome by the Mayor and response by D. H. Huntington, president of the Washington Water Power Co., various committee reports and the president's address will be presented. The morning session will conclude with a paper entitled "Aphorisms," by J. C. Ralston, who epigrammatically treats of the ap-

plication of observation, imagination and technique to the utility business.

Wednesday afternoon will be occupied with the reading and discussion of an exhaustive paper on "Practical Central Station Salesmanship," by L. A. McArthur, chairman-editor, assisted by Geo. Bowen, S. H. Hoag, W. H. Lines, Lewis A. Lewis, and C. R. Young. This paper clearly defines the field and policy of a power company in the sale of appliances. Emphasis is placed on advertising, appliance value as cost, plans for selling ranges and approved methods of operating an electric store.

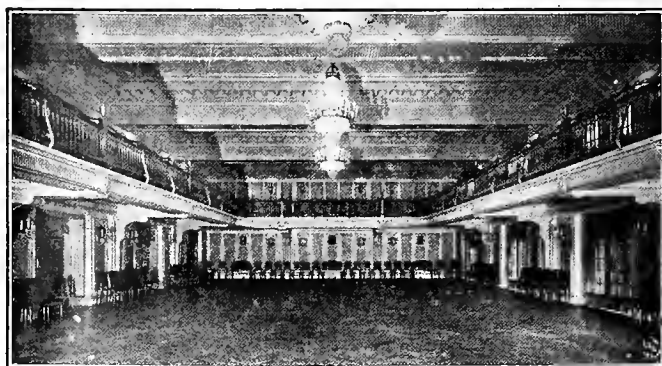


The Luxuriant Reception Room

the distribution system requirements of various appliances, including ranges and water heaters. Cost figures are a prominent feature. The gist of the argument is that the engineer's figures of construction costs and his co-operation in reducing them should be the basis of all new business efforts.

On Thursday afternoon A. C. McMicken, H. H. Schoolfield, L. R. Grant, F. O. Broili and Foster Russell will present a paper on "Co-operation in Modern Home and Apartment House Wiring." This shows that in the past no concerted effort has been made to increase the number of baseboard outlets in new houses and apartments. Suggestions are given whereby central stations may secure the co-operation of architects and contractors to this end. On Thursday evening F. D. Fagen, Pacific Coast manager of the Edison Lamp Works, will give an illustrated lecture on "Commercial and Residential Illumination."

"The report of the Electric Range Committee," W. R. Putnam, chairman-editor, will occupy Friday's sessions, both morning and afternoon. This includes the report of several subcommittees—"Merchandising," as printed in full in this issue; "Possible Improvements," in burners, ovens and general design of ranges; "Routine," handling of orders, billing, maintenance and follow-up work; "Commercial Baking and Cooking," including rates, present status in the West, difficulties experienced in introduction, average revenue, diversity factor, selling policy and general situation throughout the world; "Training Salesmen and Demonstrators," including qualifications and compensation; "Advertising" and "Electric Water Heating," the last named appearing in extended abstract in these columns. Papers will also be presented on "Compara-



The Assembly Hall

"How the Engineer Can Assist the Commercial Department" will be the subject of the session on Thursday morning. This paper, by D. F. Henderson, chairman-editor, and G. L. Duffy, H. C. Henkle, A. S. Hall and L. T. Merwin, is filled with valuable data on

tive Tests of Cooking Fuels," by B. L. Steele, and "Bus-Bar Density of Ranges," by H. B. Peirce, these papers also being published in this issue.

The banquet on Friday evening will be informal. On Saturday an instructive and interesting visit will

be made to the Bunker Hill and Sullivan mine, mill and smelter at Kellogg, Idaho.

Washington Association of Electrical Contractors and Dealers

The convention of the Washington Association of Electrical Contractors and Dealers is to be held at Spokane, September 13-15, 1917. A most helpful program has been prepared for this gathering, which in detail is as follows:

Thursday

- 10:00 a. m. Address of Welcome.....Mayor Fleming
 ResponseV. S. McKenny
 President Washington Association of Electrical Contractors and Dealers.
 Paper—"The Association Firing Line".....H. C. Rohrbach
 State Representative of the Pacific Coast Conference Board.
 12:00 m. Luncheon (Davenport's) Five Minute Talks.
 2:00 p. m. Joint Meeting with Northwest Electric Light and Power Association. Subject, "Co-operation in Modern Home and Apartment House Wiring Practice."
 6:00 p. m. Dinner (Davenport's) for Contractors and Jobbers.
 Address byHarry Byrne
 7:30 p. m. Business Session. Election.

San Francisco Electrical Development & Jovian League

The largest and most enthusiastic meeting ever held by the San Francisco Electrical Development & Jovian League took place Wednesday, September 5, 1917, at the Palace Hotel. The occasion was the initiatory meeting of the fall series. In the absence of President R. M. Alvord of the General Electric Company, who is making an extended business visit in the East, R. F. Behan of the Westinghouse Electric & Manufacturing Company took charge of the meeting and introduced Tracy E. Bibbins of the Pacific States Electric Company as chairman of the day.

W. M. Deming, who has recently assumed the business management of the Journal of Electricity was the speaker of the day and chose as his subject "Meeting Today's Business Situation." In a most interesting and helpful manner Mr. Deming drew upon his knowledge acquired in twenty-nine years of service with the General Electric Company to illustrate his points which he so forcefully brought out regarding the present critical situation in the world's industrial activity.

BUILDERS OF THE WEST—XII



JOHN M. ESHLEMAN



MAX THELEN

That the great hydroelectric securities of the West are today assisting in financing the world markets for international bond issues is in a large measure due to the fact that an harmonious, workable relationship has been established between the three parties to the issues involved in efficient utility supervision and regulation—namely between the public, the utility and the regulatory body. To the late John M. Eshleman, former president of the California Railroad Commission, and to Max Thelen, his worthy successor, the West must ever be indebted for the establishment of a tradition in fair and painstaking investigation and decision in matters pertaining to public utility activity throughout the nation, that once again adds to the building of an empire a unique and unusually helpful factor in civic growth. Through the courtesy of the H. S. Crocker Company of San Francisco, the excellent likeness of the late president of the California Railroad Commission is herewith reproduced.

Friday

- Meeting of Committees. Entertainment of Guests.
 12:30 p. m. Luncheon (Davenport's).
 2:00 p. m. Paper—"The Relation of the Electrical Contractor to the Central Station".....Mr. O. B. Coldwell
 General Superintendent Portland Railway, Light and Power Company.
 Paper—"Co-operation Between the Electrical Contractor and Jobbers"W. S. Berry
 Sales Manager Western Electric Co.
 Paper—"The Electrical Contractor".....Hugh L. Tinling
 Paper—"The Inspector's Viewpoint".....W. A. Davis
 Chief Electrical Inspector, City of Spokane.
 7:00 p. m. Banquet (Davenport's). This will be a joint banquet with convention members and friends of the Northwest electric Light & Power Association.
 The architects of Spokane will be guests at this banquet.
 Albert H. Elliot of San Francisco will address the meeting at the invitation of the Washington Association of Electrical Contractors and Dealers.
 On Saturday, September 15th, a trip is planned to Kellogg for inspection of mill and smelter of the Bunker Hill and Sullivan, the greatest lead and silver producers in the world.
 Train will leave O.-W. R. & N. depot at 6:55 a. m., arrive Kellogg 10:45 a. m.; leave Kellogg at 2:45 p. m., arrive Spokane 7 p. m.

From all appearances the convention will be well attended and a new enthusiasm among contractors and dealers in the northwest is bound to result.

It was announced that the Jovian Red Cross Smoker would take place on the evening of September 26 and all are promised an unusually interesting program combined with a jolly good time.

Los Angeles Jovian Electric League

The Los Angeles Jovian Electric League is awakening from its period of inactivity during the summer months and an interesting series of luncheons are in the stage of preparation for the fall months. Detail announcements will be made in the next issue of the Journal of Electricity.

San Francisco Section A. I. E. E.

The program committee of the San Francisco Section of the American Institute of Electrical Engineers, under the able leadership of F. C. Piatt of the Pacific Gas & Electric Company, is planning a series of meetings for the San Francisco Section during the coming season at the San Francisco Engineers' Club Rooms that will prove unusually helpful and profitable. Detail announcement of these programs will be given at a later date. The first meeting of the fall season will be on the evening of September 28th and a most interesting subject will be under discussion, namely—the sub-

marine. All members are urged to start the season with a good attendance.

The San Francisco Engineers' Club

While no formal program meetings have been held during the past semi-monthly period, the lunch service at the club is proving of such a high degree of excellency that the San Francisco Engineers' Club is earning a unique distinction in club circles of that city. This fact alone is having a very marked effect in the attendance at the noon day luncheons. Once more the informal gatherings and rounds at dominoes are becoming prevalent and a spirit of comradery and good feeling is displayed on all sides.

The Pacific Coast Gas Association

Extraordinary preparations are in progress for the twenty-fifth annual convention of the Pacific Coast Gas Association, to be held this year at Santa Cruz during the third week in September.

The usual announcement has been sent out by the secretary of the Association, Mr. Henry Bostwick; that is to say, usual as to form in that it conveys the customary information concerning time and place, transportation, hotel accommodations, and so forth. But this year the announcement is unusual in that it offers more than the ordinary inducements to the Association's membership to gather in force at the forthcoming convention on the shores of Monterey Bay.

The intellectual program offered for consideration is remarkable in its comprehensiveness. There are more papers than ever before and more varied in their selection. The program follows:

President's Address	C. B. Babcock
Who's Who; The Public; Rate Fixing Bodies; Rates; or the Company?	J. M. Berkley
Hotel and Restaurant Fuel Sales	W. E. Dugdell
Scientific Effect of the Use of Natural Gas and the Use of ... Mixed Gas on Consuming Devices	Frank S. Honberger
Early History of the Development of Oil Gas	L. P. Lowe
Radiant Heat	Fred Champion
Advertising Gas Through Appliances	A. L. Crane
Systematic Salesmanship	Geo. P. Egleston
Eliminating Waste	A. B. Day
Can Profit Sharing with Employees be Successfully Worked Out? On What Lines and Where?	R. H. Ballard
Natural Gas	A. B. Macbeth
Gas Heating Systems	M. L. Neely
Gas Measurement	B. G. Williams
Standard Flanges for Flanged Pipes, Valves and Fittings,	J. P. Baloun
Some Notes on the Industrial Use of Gas in England	Robert W. A. Brewer
A Study of Efficiency and Utilization Gas in Top Burners,	Prof Charles Norman Cross
Wrinkles	D. J. Young
Experiences	John Clements

In addition, it is promised that the reports to be rendered by the chairmen of our several standing committees will be of more than passing interest.

There is to be a gas exhibit upon a scale never attempted before. This is being arranged under the direction of Mr. B. S. Pedersen. An admirable location has been secured in the Casino convenient to the travel between the hotel and the beach. The Gas Appliance Committee announces that the following thirty-two exhibitors have secured space in the Gas Exhibit at the forthcoming convention:

Popular Lecture on Home Lighting

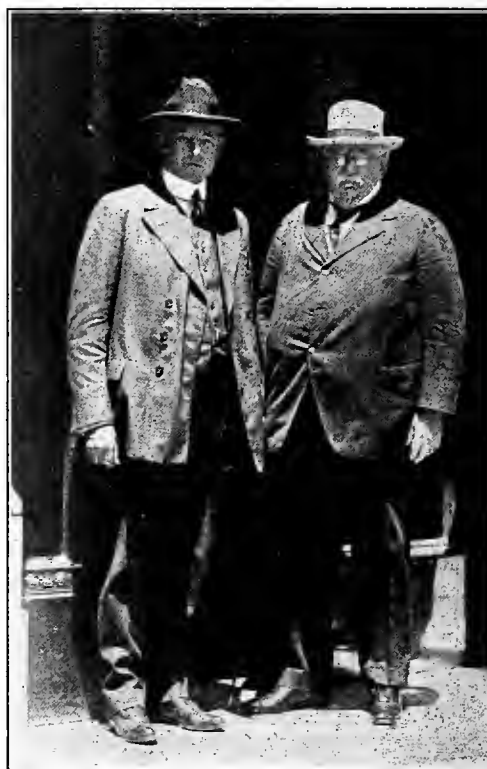
The second of the series of illustrated popular lectures is now ready for distribution. This lecture answers the question "how shall I light my home?"

This lecture with accompanying lantern slides, may be secured for presentation upon application to the General Offices of the Illuminating Engineering Society, 29 West 39th Street, New York, N. Y.

President Vail Visits Pacific Coast

One of the most interesting happenings in electrical circles of the past several months is the recent visit to the Pacific Coast of Newcomb Carlton, president of the Western Union Telegraph Company and Theodore N. Vail, president of the American Telephone and Telegraph Company. Announcement of the presence of these distinguished visitors was made in the columns of the Journal of Electricity Aug. 15, 1917, page 185.

In view of the present war situation, a most interesting feature of his visit was a side trip to the Monterey Presidio, 125 miles south of San Francisco, where the Eighth battalion of the Signal Reserve Corps is in intensive training. As is well known, this battalion is entirely composed of employees of the Pacific Telephone and Telegraph Company, who have been at Monterey since July 1, engaged in active preparation for the work to come. Mr. Vail was accompanied to Monterey by H. T. Scott, chairman of the board of directors; G. E. McFarland, president, and J. C. Nowell, general manager



G. E. McFarland, president of the Pacific Telephone & Telegraph Co., and Theodore N. Vail, president of the American Telephone & Telegraph Co.

of the company, the party being in direct charge of Major D. P. Fullerton of the Eighth battalion. The visiting guests were spectators at a review given in their honor, and were much pleased at the appearance and condition of the Telephone contingent. Mr. Vail evinced much interest in the conversations he held with many of the officers and "rookies." He addressed the men in part as follows:

"It is with pleasure and satisfaction that I meet you on the shores of the Pacific. Only a few days ago it was my pleasure to meet on the shores of the Atlantic a group of reserves, all from the Bell System, who may be now on their way to the field of activity.

"While there is sorrow and pain connected with the going yet it is not so much because of the going as it is because of the existence of the necessity for your going.

"The necessity existing—and it does—there should be joy and satisfaction that you are going to protect your country, which protects you in your enjoyment of life and liberty, the country which protects your substance and gives you opportunity such as no other country gives its people."

NEW POWER BUSINESS AND FINANCIAL ITEMS

Commission Frowns on Reduced Rate

The Home Telephone Company of Portland, which recently passed into the hands of a receiver, sought to increase its subscribers by offering three months' free service. When this procedure was brought to the attention of the Oregon Public Service Commission it immediately issued an order enjoining the company from establishing such a practice. The commission held that "giving free service for three months or any other length of time, or at a reduced rate, to new subscribers is the giving of an undue and unreasonable preference and advantage to new subscribers over old ones. * * * Any utility which furnishes or offers to furnish service free, or at reduced rates, or which makes any concession whatsoever to new subscribers not only violates both the letter and the spirit of the Utilities Act, but subjects those to whom such service is furnished to a severe penalty."

Increased Earnings at Portland

Increase of 29 per cent in net earnings of the Pacific Power & Light Company, under the same management and control as the Portland Gas & Coke Company for June compared with the same month of last year is attributed to the fact that a year ago operating expenses were not normal, according to official reports just issued. For the same reason that adverse conditions influenced the operation of the properties, operating expenses for the fiscal year just closed advanced 8 per cent, while gross earnings increased only 7 per cent, making a gain of 6 per cent in net earnings over the preceding period.

Following is a summary of the statement:

	June, 1917	12 Months
Gross revenue	\$132,346	\$1,537,523
Operating expenses	57,825	771,547
Net earnings	\$ 74,521	\$ 765,976
Balance after deducting all fixed charges.	\$ 38,182	\$ 350,897

Utilities Commission of Idaho

In the matter of the application of Nevada Power Company for a certificate of public convenience and necessity, it appearing that although the territory through which the Nevada Power Company proposes to construct such transmission and distributing lines is contiguous to territory now occupied and supplied by the general electrical system of the Idaho Power Company, said Idaho Power Company has filed its appearance in this matter and has consented to the construction, maintenance and operation of such transmission and distributing lines by said Nevada Power Company for the restricted purposes as hereinbefore set forth and for the sale of the electric current and energy, so transmitted, consequently the commission issued the request.

In the matter of the application of Utah Power & Light Company for a certificate of public convenience and necessity in the village of Newdale, Fremont County, Idaho, the commission has ordered that the Utah Power & Light Company be and it hereby is authorized to continue the furnishing of electrical service to the village of Newdale, Idaho, and its inhabitants.

A New Business Record for Colorado Power Company

The Colorado Power Company reports July as the best month in the corporation's history as to new business. In July it closed seventeen new power contracts aggregating 3259 h.p. with an estimated annual revenue of about \$112,000. Business disconnected in the same month aggregated 555 h.p. with an annual revenue of about \$23,000. The resultant net gain was 2695 h.p. and \$89,000 per annum, respectively.

For seven months ended July 31st, net gain in power contracts amounted to 5058 h.p. with an estimated annual revenue of \$150,000.

Estimated annual gross revenue from business under contract awaiting connection as of July 31st, was \$154,800. It is expected that all of this business will be operative by the end of the present year.

This company generates over ninety per cent of its energy hydraulically. Under the terms of certain large wholesale contracts it can withdraw from the wholesale service as required by the retail service. No plant extensions are necessary to serve the business above mentioned and in fact the corporation can, without appreciable additional investment, serve approximately 15,000 h.p. additional retail load. The increased load from retail territory is occasioned by substantial mining operations on a large scale as well as by new electro-metallurgical reduction processes on established commercial lines.

Increased Load for the Western States at Richmond

The Swift Nail and Tack Company will locate a factory at Richmond, employing 60 men to start. This is the fifth concern to locate at Richmond during the past month three of which have already closed contracts with the Western States Gas & Electric Company for their power requirements. The company is negotiating for the power requirements, amounting to 100 h.p. in motors, of the Allied Union Brick Company which has taken over the old Cary brick plant and will start operations within the next month after extensive improvements. During the week ended August 10 the Western States Company secured contract for an additional 10 h.p. in motors for the Western States Porcelain Company.

Motor Equipment for Pulp Mill in Washington

Orders for the complete motor equipment of the new plant of the Washington Pulp & Paper Company's new mill at Port Angeles, Washington, have been received by the Westinghouse Electric & Manufacturing Company, of East Pittsburgh, Pa. There are included a total of 42 motors with a total of 3380 horsepower, two motor generator sets, and two 2000 kva. transformers, 6600 to 2300-460 volts, and three 300 k.v.a. transformers 2300 to 460 volts. All motors of 500 h.p. and above will be supplied at 2300 volts. Synchronous motors will be provided with starting panels; these as well as the starting switches for induction motors will be equipped with ammeters and overload and no-voltage protection.

Foreign Orders Taken in San Francisco

The Pacific Electric Mfg. Co. of San Francisco is filling many foreign as well as domestic orders for oil and air switches. In transit to the Pearson Oil Syndicate at San Paulo, Brazil, are 12 tons of oil switches; the Cerro de Pasco mines in Peru have 12 tons of oil and air switches enroute. A shipment of 3700 lbs. of air break switches has been sent to Bangkok, Siam. Two 45,000 volt oil switches have been sent by express to Anniston, Alabama, seven 35,000 volt pole top switches to the Chilecothe encampment in Ohio, as well as to the American Lake encampment. Both the Washington Water Power Co. of Spokane and the American Power and Light Co. of Dallas, Texas, have ordered two 60 k.v.a. switches and many other smaller orders are being filled.

New Factory Load in San Francisco

American Ever Ready Works of the National Carbon Co., expect to move into their new factory at San Francisco on September 15th. Complete details will be published later.

Los Angeles Firms Get Australian Business

The U. S. Electrical Manufacturing Company of Los Angeles, manufacturers of direct and alternating current machinery have received two large contracts from the Australian government for electric motors for use in Australian canneries. This is only one instance of the large orders received lately for cannery motors, the others being for the entire motor equipment for H. G. Prince Company of Fruitvale, and the United Canneries Company of Ontario. Business in Portland, Oregon, has also made tremendous leaps.

Fairbanks Morse Secures Big Sale

Fairbanks, Morse and Co. have recently equipped the Berkeley, Calif., plant of the Hall Scott Motor Company, manufacturers of aeroplane motors, with 69 electric motors aggregating 300 h.p. and ranging from 1 to 10 h.p. in size. They have also contracted with the National Ice and Cold Storage Co. to equip all of their California plants with electric motor drive superseding steam drive of compressors. The order includes three 50 h.p., four 75 h.p., two 100 h.p., two 150 h.p. and two 175 h.p. motors as well as 26 motors ranging from 5 to 25 h.p.

Westinghouse Motors for Nevada

An order for electric hoisting equipment from the Nevada Consolidated Copper Company for its mine at Ruth, Nevada, calls for a 400 h.p. Westinghouse type Cw wound-rotor induction motor and complete control equipment, comprising a Westinghouse liquid controller with necessary electromagnetic switches. The hoist is to raise a load of 12,000 lbs. of ore every 86 seconds through a distance of 720 ft.

Southern Pacific Makes Large Locomotive Purchases

Sixty-five new locomotives, costing over two and a half million dollars, are on order for the Pacific System lines of the Southern Pacific according to an announcement by Wm. Sproule, president of the company who returned recently from New York and other Eastern cities. Ten of the locomotives are to be built at the company's shops. This latest order brings the total expenditures for new equipment by the Southern Pacific and Pacific Fruit Express of which it is half owner, to twenty-four and a half million dollars.

Turbine Auxiliary in Alaska

The Alaska Treadwell is sending its 2000 kw. turbine across the channel from Douglas Island to operate an auxiliary at the Alaska-Juneau mill.

Large Increase in Electric Energy Output at Stockton

The electric heating and cooking campaign conducted by the Stockton, California, division of the Western States Gas & Electric Company has resulted in the addition of more than 453 kw. to Stockton's energy output. More than 50 electric ranges have been sold, 41 water heaters and 18 air heaters. New business recently closed by the Company includes 150 horsepower additional for the Samson Sieve-Grip Tractor Company and 60 horsepower additional for the State Hospital. The Company is negotiating with the Union Ice Company for the electric energy requirements of its new refrigeration and cold storage plant, amounting to about 200 horsepower in motors. Stockton's new city directory fixes its population at 48,008, which is an increase of 3,288 over last year.

Kalispell Company Extends Service to Forty-two Ranches

Irrigation in the Flathead Valley of Montana by means of electric pumps is receiving more and more attention each year. During the present season, which has been unusually dry, a number of ranchers who operate pumps for irrigation have harvested enormous crops as a result of their foresightedness. These pumps are operated electrically with current furnished by the Northern Idaho & Montana Power

Company, which is now extending similar service to forty-two other ranches in a 4,000-acre tract just west of Kalispell. Besides irrigating, farmers will use electric power for grinding feed, sawing wood, separating milk, lighting barns, etc. A number of other agricultural districts have petitioned the company for electric service and investigations are being made.

Lend Electric Apparatus Experts to the Government

Through the agency of the national committee on gas and electric service of the Council of National Defense a number of electric light and power companies have arranged to loan men to the Quartermaster General's department to visit plants where electric apparatus is in process of manufacture, to supervise progress and expedite delivery. The services of these experts will be voluntary. Seven of the largest electric light companies have also furnished Colonel Littell a number of men to act as purchasing agents to assist the purchasing department of the Quartermaster General's Corps.

Urgent Needs of the Ordnance Department of the Army

The United States Civil Service Commission announces the following open competitive examinations for positions in the several ordnance establishments of the War Department or in or under the office of the Chief of Ordnance, War Department, Washington, D. C. The salaries named are for entrance:

Mechanical engineer, artillery ammunition, \$3,000 to \$3,600 year.

Mechanical engineer experimental work, \$2,500 to \$3,000 year.

Mechanical draftsman, \$1,000 to \$5,400 year.

Apprentice draftsman, \$480 year.

Inspector of artillery ammunition, \$1,500 to \$2,400 year.

Inspector of field artillery ammunition steel, \$1,500 to \$2,400 year.

Assistant inspector of field artillery ammunition steel, \$3.50 to \$5 day.

Inspector of ammunition packing boxes, \$3.52 day to \$1,800 year.

Inspector and assistant inspector of powder and explosives, \$1,400 to \$2,400 year.

Inspector of ordnance equipment, \$1,500 to \$2,400 year.

Assistant inspector of cloth equipment, \$80 to \$125 month.

Assistant inspector of leather, \$100 to \$125 month.

Assistant inspector of small hardware, \$80 to \$125 month.

Assistant inspector of textiles, \$80 to \$125 month.

Assistant inspector of leather equipment, \$100 to \$125 month.

Clerk qualified in business administration, \$1,200 to \$1,500 year.

Index and catalogue clerk, \$1,000 to \$1,200 year.

The examination for index and catalogue clerk is open to both men and women; the other examinations are open only to men.

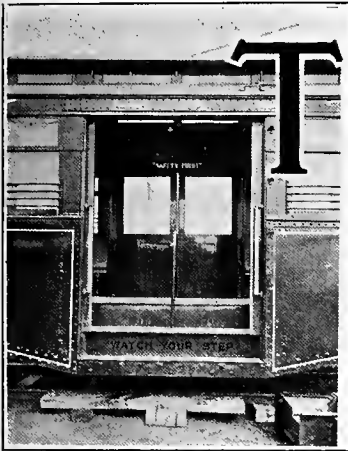
The Government urgently needs men for the work above indicated, and qualified persons are urged as a patriotic duty, to apply for examination. Until further notice applications for the positions named will be received at any time by the United States Civil Service Commission, Washington, D. C. Papers will be rated promptly. Applicants will not be required to appear at any place for examination, but will be rated principally upon the elements of education, training, and experience, as shown by their applications and by corroborative evidence.

Full information concerning examinations, application blanks, etc., may be obtained by calling in person upon the secretary of the local board of civil service examiners at the post office in any city in which city delivery of mail has been established, or by communicating with the United States Civil Service Commission, Washington, D. C.

LATEST IN EVERYTHING ELECTRICAL

(New features in car design are constantly appearing in the new electric systems of the West that testify forward not only the comfort and safety of the passengers but the efficiency of the handling of the traffic of an entire system. Here is an article on the new center entrance cars that have recently been placed in operation on the Key Route Systems of California. This system, together with the Southern Pacific lines in the San Francisco Bay region, is said to cause more people to pass daily through the great Ferry Building at the foot of Market street in San Francisco, than in any other depot of the world, with the possible exception of the union depot in Paris. Other items of interest in new developments in electrical design follow this article.—The Editor.)

NEW CENTER ENTRANCE CARS FOR SAN FRANCISCO-OAKLAND TERMINAL RAILWAYS



"Watch Your Step"

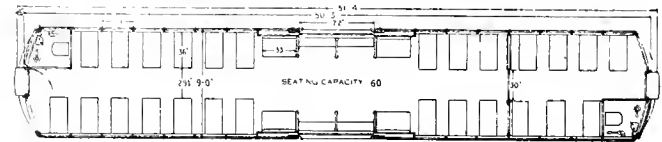
speed. On the mainland, city streets are traversed to the terminals, reducing the speed and calling for frequent stops.

Hitherto the cars employed on the Key Division have been of the end-platform type; these new cars are the first to have center platforms. The reduction of time which the new type effects over the old, together with re-routing the lines and instituting a new express schedule, is expected to cut down the running time between the Oakland and Berkeley terminals by about 15 minutes.

The underframes have as their chief longitudinal members 6 by 3½ by ¾ in. angle side sills and 8 in. I-beams. Channel crossings alternating 6 in. and 3 in. in size are connected to the center sills with corner brackets. Built-up bolsters of open-truss construction, bent down at the ends and lipped under the side sills, have 9 by 1 in. top-plate and 9 by 1¼ in. bottom plate. The arrangement of the diagonals will be seen in the framing diagram.

In the side construction a plate girder is formed of ½ in. plate riveted to the angle sill, to an angle at the top and to T-posts and channel door posts. Compensation for inter-

rupting the plate girder construction at the side doors is obtained by framing the doors with 9 in. channels and with angles riveted into channel construction in the section of the top panel which spans the doors. The T-posts are 1¾ by ¾ by ¼ in., and extend to the top of the letter panel which is composed of No. 16 gauge steel, 8¾ in. wide, and riveted at the top to a light angle. Steel carlines reinforce the wooden carlines of the monitor deck. The two carlines nearest each end of the car are of suitable dimensions to properly support the pantograph trolley standard on the lines.



Height from bottom of sill at bolsters to top of monitor roof, 9 ft 8 in.

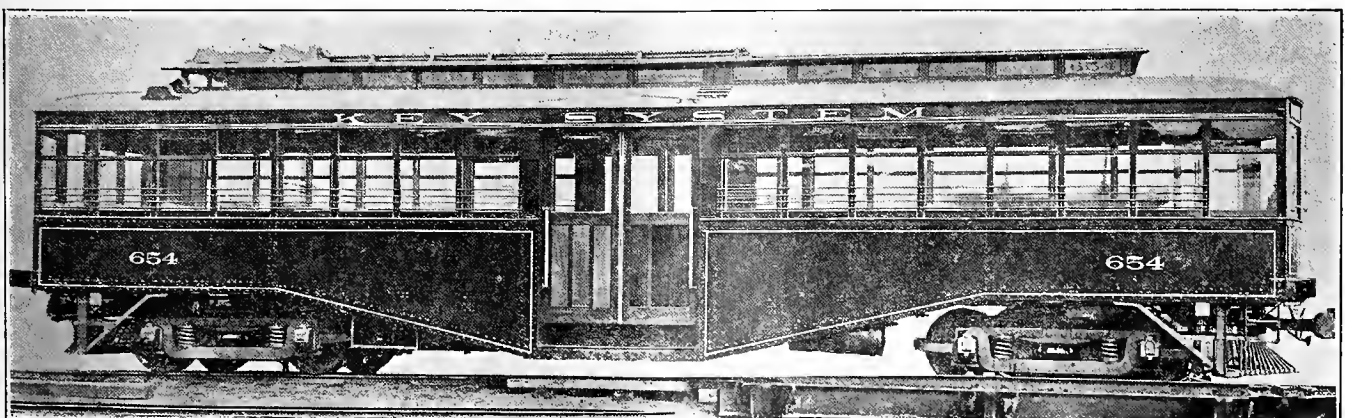
General Plan of Car Design

rupting the plate girder construction at the side doors is obtained by framing the doors with 9 in. channels and with angles riveted into channel construction in the section of the top panel which spans the doors. The T-posts are 1¾ by ¾ by ¼ in., and extend to the top of the letter panel which is composed of No. 16 gauge steel, 8¾ in. wide, and riveted at the top to a light angle. Steel carlines reinforce the wooden carlines of the monitor deck. The two carlines nearest each end of the car are of suitable dimensions to properly support the pantograph trolley standard on the lines.

As the illustrations and floor plan clearly show the division of the car into smoking and general compartments, the seating arrangement, the cabs at the diagonal corners, and the door and step arrangements, these will not be described in detail. The Brill Renitent Posts are an important feature of the construction. As they are of spring-brass and form the runways for the lower sashes the sashes may be removed or inserted without tools and by simply grasping at the top and bottom and pressing sideways; they also make the sashes interchangeable. Renitent posts were furnished in the 30 city cars built for this company. The upper sashes are stationary and are framed continuously from door posts to corner post, the top rail being capped by flanging the lower edge of the letter panel.

The partitions, doors, window sashes, ventilator sashes and other wooden parts of the interior finish are of mahogany, and the ceilings and wainscoting are of 3/16 in. composite material. Brill "Winner" seats with 18 in. backs and corner grab-handles are the same as are used in the city cars.

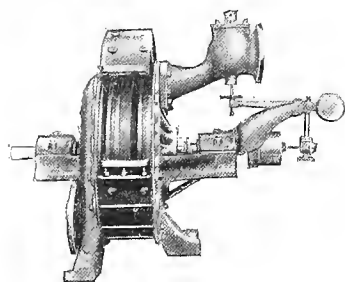
The trucks on which the cars are mounted are of the Brill 27-M C. B. 2 type with 6 ft. 6 in. wheel base and provided with 34 in. diameter wheels.



Exterior View of New Cars for the Key System

CURTIS STEAM TURBINE FOR FANS, BLOWERS AND PUMPS.

The General Electric Company of Schenectady, N. Y., has developed a Curtis steam turbine in a wide variety of capacities



Improved Curtis Turbine, showing Split Casing

ties to drive fans, blowers and pumps for boiler feeding and circulating systems.

It is called the Type L and is of the impulse type. The number of stages and rows of buckets vary with the capacity. The principles used and mechanical practice evident in the construction are the result of the vast experience of the manufacturers in producing turbines for practically every class of service.

A split wheel casing is used to permit ready inspection of the buckets which are of bronze securely dovetailed into the rim of the wheel. The exhaust steam is free from oil and is well suited for heating feed water.

Speed regulation is close and reliable and the speed may be changed by hand wheel adjustment while the turbine is in operation. A constant running speed is maintained by a single and powerful speed governor mounted directly on the shaft and controlling a double balance piston valve type throttle.

A NEW HEAT INSULATING MATERIAL

Sil-o-cel is a white powder weighing about 8 lb. per cubic foot. It is found in a natural rock form in exceptionally pure deposit on the Pacific Coast. By a special process the powder form is produced. Sil-o-cel has an insulating value equal to cork, and ten or twelve times that of fire brick. Being almost pure silica its melting point is about 1610 deg. C. (2930 deg. F.) which is a great advantage over cork and most other insulating materials. Sil-o-cel is inert—it does not contain organic matter—it will, therefore, keep in good condition for all time. It is fire proof and germ proof, and lower in cost than most other insulating materials. Tests show that by surrounding a 30-gallon household boiler with a frame of ordinary tongue-and-groove wood, allowing a 3-inch space between the outer shell of the boiler and the inner shell of the tongue-and-groove holder filled with Sil-o-cel powder completely covering the boiler excepting the bottom, it will take several times as much heat energy to keep the water in the boiler hot with an ordinary galvanized uninsulated boiler as with the same boiler insulated with a covering of three inches of Sil-o-cel powder, as above described. It has been found that the total cost of insulating an ordinary household boiler with Sil-o-cel powder three inches in thickness including the cost of Sil-o-cel, lumber, labor and all incidentals, will be about \$6.00.

UNIVERSITY EXTENSION CLASSES IN CALIFORNIA.

The first week of September saw the enrollment of thousands of students for the hundred and fifty University Extension classes, organized in San Francisco and Oakland by the University of California. The prospective students in these evening and Saturday classes are now being enrolled at the San Francisco headquarters of the University Extension Division in the Lick Building, 62 Post Street, and also at the University Extension headquarters in California Hall at the university.

The technical courses are unusually popular. The repair and maintenance of automobiles such a course, also, exclusively for women; automobile electricity, chemistry, chemistry for nurses, electricity, electrical shop work, household electricity, navigation and nautical astronomy, machine shop

practice, telephony, wireless telegraphy, radio communication, a course for women in wireless telegraphy, woodwork, a course for women in woodwork, applied mechanics, and reinforced concrete.

SAFETY FIRST ENCLOSED LEVER SWITCHES

Safety-first Combined Lever Switches and Fuses as described in Bulletin No. 47380-A, which has just been issued by the General Electric Company, are destined to fulfill an important part in the present active campaign to safeguard life and property which is being carried on by such bodies as the Bureau of Standards, the National Board of Fire Underwriters, and by public service and safety commissions in several states.

The important features of the Safety-First Enclosed Lever Switches, as contained in the bulletin are:

1. Current-carrying parts are completely enclosed and inaccessible while alive.
2. Fuses are accessible only when they are "dead" and when the switch is in the "off" position
3. Switches can be locked in the "off" position.
4. The fuse chamber can be locked to prevent access by unauthorized persons, without interfering with the operation of the switch.

Full information regarding construction and dimensions of the three types will be found in this Bulletin.

MOTOR DRIVEN BULL FRAME

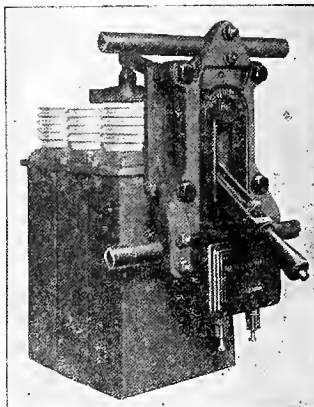
For drawing wire of sizes from 7/16 in. to 1 in. diameter, the two-block horizontal spindle bull frame shown in the accompanying illustration is

made by the Morgan Construction Company of Worcester, Mass. It will handle square, hexagonal, and round sections with pull at the die of from 10,000 lbs. to 20,000 lbs.

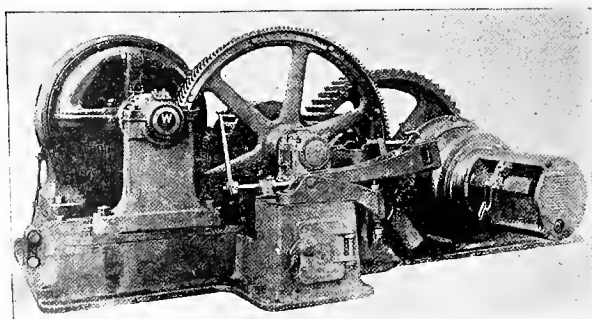
A special feature of this line of machines is a winding block so arranged that while the pull is always close to the main bearing, the coiled wire moves out to the end of the block in a regular helix without bunching or crowding. In addition to the safety afforded by quickly stopping characteristic of individual drive, a friction clutch is contained in each block

which instantly disengages the block from the mechanism. Thus by the movement of the clutch lever, the drawing may be stopped at any time regardless of the strain on the block.

This machine, which is intended for heavy work at high speeds, is equipped with a 150 h.p. type C. S. induction motor made by the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa. Other sizes are driven by motors down to 50 h.p.



New Wall Bracket for Circuit Breaker



Improved Motor for Bull Frame

NEW BOOKS AND BULLETINS FOR ENGINEERS

New Apparatus

Century single-phase self-starting motors of 1/10 to 40 h.p. of the repulsion start induction type are described in bulletin 24 just issued by the Century Electric Company of St. Louis. The booklet contains 63 pages and is handsomely illustrated.

Electric Heating Appliances

One of the handsomest pieces of publicity that has made its appearance for some time is that of the Hughes Electric Heating Company of Chicago describing in a fifty-two page booklet the Hughes electric heating devices. Illustrations are given which show effectively the many uses of the electric range in domestic and commercial life.

The Hotpoint Electric Heating Company of Ontario, California are distributing to the trade a new list of prices on Hotpoint electrical appliances and an attractive pamphlet on "Why people buy the Hotpoint Vacuum Cleaner."

Scientific and Engineering

Carbon monoxide poisoning in the steel industry is the subject matter of technical paper 156 recently issued by the Bureau of Mines.

The monthly statement of coal mine fatalities in the United States, for May, 1917, by the Bureau of Mines, contains a list of permissible explosives, lamps and motors tested prior to June 30, 1917.

A booklet entitled "American Sea Power" containing a reprint of editorials dealing with the production of ships to meet the present emergency, has recently been issued by the Evening Mail of New York City. The booklet also contains a series of articles on oil and its relation to commercial and marine development.

Advanced first-aid instructions for miners, comprising a report of standardization by a committee of engineers, S. H. Halberstadt, A. F. Knoefel, W. A. Lynott, W. S. Rountree and M. J. Shields has made its appearance to the trade and will be found exceedingly useful and helpful. This little booklet of 150 pages is published by the U. S. Bureau of Mines.

A list of inspected mechanical appliances containing a list of inspected electrical appliances and a list of appliances inspected for the accident hazard, has been recently published by the underwriters' laboratories of the National Board of Fire Underwriters. The booklet is for service, not profit, and as a consequence it has unusual value for electrical engineers.

An address by W. H. Hodge, publicity manager of H. M. Byllesby & Company, "The Customer as a financial partner in a public utility," has been printed in pamphlet form under the title "Rational Public Ownership." It was made as a lecture April 2 in the Course in Public Utilities Operation of the Graduate School of Business Administration, Harvard University. Copies will be sent to inquirers upon request. Address the Publicity Department of H. M. Byllesby & Company, Chicago.

The possible recovery and utilization of pyrite occurring with bituminous coal is suggested in circular 5 of the Engineering Experiment Station of the University of Illinois by Professor E. A. Holbrook of the department of mining engineering. A series of experiments conducted on a commercial scale has shown that, where pyrite occurs in sufficient quantities to justify its recovery, a 50-ton plant may be designed to serve a single mine or group of mines which will yield a

profit of about \$75 per day, or \$1.50 per ton of raw pyrite, with an initial capital cost of about \$18,000.

The sixth annual report of the commissioners for the Toronto Hydroelectric System is now available. The report contains thirty-two pages of beautifully illustrated reading matter wherein is set forth the distribution of electric power in the City of Toronto and the issue of \$2,750,000 of City of Toronto 4 per cent sinking fund debentures payable on 1st July, 1948, to provide the funds necessary for the cost of the said works, etc. The electric power required is supplied from Niagara Falls by the Hydroelectric Power Commission of Ontario.

Mechanical Equipment of Buildings.—Vol. 2

A reference book for Engineers and Architects, by L. A. Harding, and A. C. Willard, and published by John Wiley & Sons, Inc., N. Y. For sale by Technical Book Shop, San Francisco. Size: 7 by 9¼ in., 766 pp.; illustrated, flexible binding. Price \$5.00.

This book is a new departure in the literature on the mechanical equipment of buildings. It proposes to deal not only with power plants and refrigeration, to which this volume is devoted, but also with the heating and ventilation of buildings which is considered in Vol. 1 already published. In addition to these two volumes a third volume on elevators, lighting systems, sprinkler systems, vacuum cleaning, and plumbing is now in preparation.

The aim has been to produce a reference book for engineers, containing sufficient theoretical and commercial data for practical use in the designing room, and also show the student of this subject the relation between the theoretical principles involved and their practical application to actual problems.

The authors are Louis Allen Harding, B. S., M. E., chief engineer and member of firm of John Cowfer Co., Buffalo, N. Y., and Arthur Cutts Willard, assistant professor of Heating Ventilation, University of Illinois.

A preliminary discussion of physical units and the measurement of heat, is followed by data and tables on the characteristics and performance of water, steam and air. Design and construction of boilers and power plants are treated in detail.

The chapters on artificial refrigeration contain comparative data on the various methods in use, and the attendant advantages of each. These cover the field so completely and so simply that the book will prove an indispensable aid for engineers installing mechanical equipment of this nature.

How to Make High Pressure Transformers

By F. E. Austin, professor of Electrical Engineering at Dartmouth College, Hanover, N. H. Size 4½ by 7 in., 47 pp., cloth binding. For sale at the Technical Book Shop, San Francisco. Price 65c.

This book tells in simple language just how to make different types of transformers for high voltage use. Information is given on the method of procedure for designing and constructing transformers for any special purpose, formulae being given for calculation of the various losses, thus insuring a suitable design. Full instructions for building the cores, and winding the coils, make this a valuable book for any person interested in high tension work.

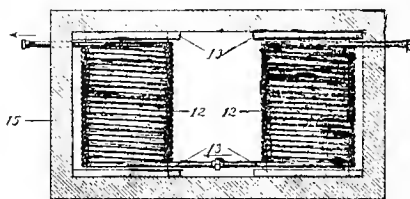
The author is head of the Department of Electrical Engineering in the Thayer School of Engineering, connected with Dartmouth College, and has published numerous other books on related subjects, which have been greatly in demand.

WHAT WESTERN INVENTORS ARE DOING

(High head water wheel development has proven in the past so eminently successful that design of this nature may now well be said to be traditional in its activity. Here is a brief description of a new patent relating to speed-governors by William A. Doble, formerly chief engineer of the Pelton Water Wheel Company. Other briefs on a cooling-coil, an electrical motive apparatus, an electrical massage apparatus and an electric-lamp support follow.—The Editor.)

1,235,181. **Cooling-Coil.** Augustine S. Beltink, Oakland, Cal.

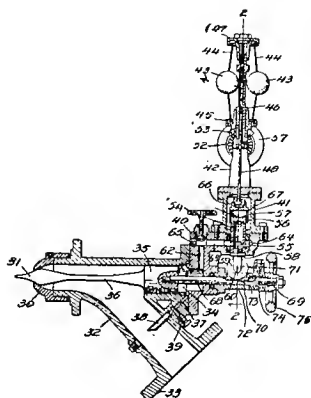
In a cooling device, a container, a core having a broad flat upper face and having grooves therein, a pipe positioned around the core and engaging within the grooves to prevent displacement thereof, plates secured to the ends of the core and abutting the front and rear sides of the container, to



hold the core against longitudinal movement, one end of the pipe being horizontally extended through an end of the container, to hold the core in position, and said end plates being extended upwardly to project above the coils and said horizontally extended end of the pipe to protect the coils and said pipe end.

1,234,882. **Speed-Governor.** William A. Doble, San Francisco, Cal., assignor to The Pelton Water Wheel Company, San Francisco, Cal., a corporation of California.

In a speed controlling mechanism, the combination of a controlling element, fluid pressure means for actuating said element, speed responsive means, a pilot valve actuated by

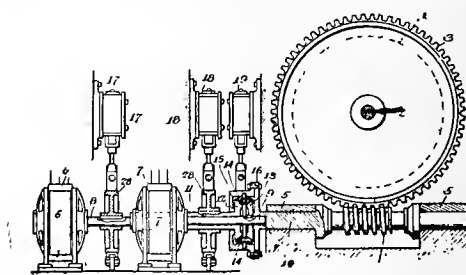


said speed responsive means, a member having a cam surface and arranged to be moved with said controlling element, and a valve actuated by said cam surface and co-operating with said pilot valve to control said fluid pressure means.

1,235,132. **Electrical Motive Apparatus.** Robert H. Gaylord, Pasadena, and Guy B. Capps, Los Angeles, Cal.

A driven element, two induction motors, braking means for the motors respectively, and means connecting said motors to the driven element whereby when the motors are operated at synchronous speed in the same direction as one another the driving element is driven and when one motor

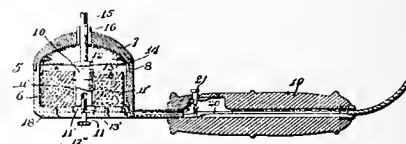
is held against rotating the other motor will be operated by the driven element at a greater speed than synchronous speed



so that said operating motor will produce dynamic braking action.

1,234,763. **Electrical Massage Apparatus.** Samuel W. Hills, Jerome, Idaho.

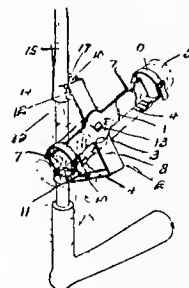
In an electrical massage apparatus, the combination of a casing, an electromagnet provided with a core, a substantially circular armature of soft metal in operative relation to, and having a diameter co-extensive with the diameter



of the core, a diaphragm comprising a pair of dove-tail shaped spring steel members carried upon diametrically opposite sides of the armature and arranged medially of and in the same plane with said armature, a closure for said casing, the outer edges of said diaphragm members being frictionally held between the casing and the closure, and a tool holder mounted upon said armature.

1,234,833. **Electric Lamp Support.** John W. Walter, Los Angeles, Cal.

A lamp support comprising a supporting member having means for holding a lamp, and an attaching member pivotally



connected with said supporting member, for angular adjustments, said attaching member being provided at one end with a right angular arm, said arm and the other end of said attaching member having engaging members for attaching said member to an object.

NEW ELECTRICAL DEVELOPMENTS

(A ruling to the effect that a Federal Land Bank may make a loan on lands in irrigation districts which have an outstanding bond issue, where the funds necessary to take care of the indebtedness are collected in the same manner as taxes, is the most important new electrical development of the past semi-monthly period. An increasingly brightened future is thus held out for electric power loads on projects of this nature. Other items of interest throughout the West may also be found in the following lines.—The Editor.)

FINANCIAL

VALLEJO, CAL.—The Pacific Gas & Electric Company will soon file a bond for \$15,000 for the privilege of operating within this city.

IDAHO FALLS, IDAHO.—An election will be held here on September 18th for the purpose of voting on bonds in the sum of \$35,000 with which to acquire an electric light and power plant.

SAN FRANCISCO, CAL.—President John B. Miller of the Southern California Edison Company has issued a statement denying that the company has applied for further issue of 21,174 shares of common stock.

SAN BERNARDINO, CAL.—That sentiment is strongly in favor of a bond issue to acquire the distributing systems of the Southern California Edison Company and the Southern Sierras Power Corporation will be the report of city officials at the council meeting. J. R. Mason & Co., irrigation district bond dealers have received the following letter from the attorney of the Federal Land Bank of Berkeley, which covers points of great importance:

Gentlemen: Replying to your letter of recent date, will say that this bank can make loans on lands in irrigation districts which have an outstanding bond issue, where the funds necessary to take care of the irrigation indebtedness are collected in the same manner as taxes. Of course, in making loans on such lands the amount of the outstanding bond indebtedness would be taken into consideration in determining the amount that would be loaned on such lands.

INCORPORATIONS

ELKO, NEV.—The Nevada Power Company has been incorporated here for \$250,000.

TRANSMISSION

MARSHFIELD, ORE.—A survey is being made of the Golden Falls property with a view to converting it into a hydroelectric plant.

TACOMA, WASH.—The question of voting \$3,000,000 with which to purchase Lake Cushman as a municipal power site will be voted upon next month.

REDDING, CAL.—The Pacific Gas & Electric Company has a force of seventy-five men at work at the intake on the big bend of the Pit River.

VENTURA, CAL.—Steps are being taken by the Southern California Edison Company for running of the high line proposed by that company from Castaic north of this city and through to Santa Barbara.

LOS ANGELES, CAL.—An order has been made by the board of supervisors directing chief mechanical engineer to complete plans and specifications and secure a building permit for the construction of a power house at the county hospital.

SAN DIEGO, CAL.—The San Diego Consolidated Gas and Electric Company plans to extend its electric power lines all through the county. The company is seeking a county franchise to save expense in advertising each time an extension is made.

OLYMPIA, WASH.—The bids opened by the State Board of Control for the construction of a power house at the state

insane asylum, Sedro-Woolley, Wash., resulted in the War-lack Construction Company of Seattle, receiving the contract at a price of \$24,200.

VISALIA, CAL.—All night fighting with over 300 men from the mountains, Visalia, Hanford and other localities, in an effort to save the Hammond plant of the Mount Whitney Power & Electric Company on the east fork of the Kaweah River, was reported to have been successful.

PORTLAND, ORE.—The engineers working on the interstate bridge have recommended that motor generator sets be installed, so as to make use of 11,000 volt lines to operate the bridge draw in case the voltage on the Portland Railway & Power Company line is pulled down. The generator sets would cost \$5288, plus installation costs.

ELKO, NEV.—Elko Lamoille Power Company officials say during the past month its power line over the summit of the hills south of Elko has been practically demolished three times. Every pole on the line has been splintered by lightning, most of them so badly they had to be replaced, and many of the poles have been replaced two or three times.

ROCHESTER, NEV.—Joe Beane, superintendent of the Nevada Valleys Power Company, announces that the company is constructing a power line through Humboldt and Lander counties, to connect with the line at Rochester. A line will also be run to the various towns and valleys along the route. A line is to be extended to Golconda, and from there to Winnemucca and into Grass Valley.

LOS ANGELES, CAL.—The San Joaquin Light & Power Corporation has announced that a total of from 10 to 20 miles of new trunk lines for power will be constructed immediately in San Joaquin Valley, with a large number of laterals for the different ranches. The power company will also build a substation at Chowchilla, to cost at least \$25,000. The total cost of the trunk lines is estimated at \$201,000.

TRANSPORTATION

SANTA ANA, CAL.—It has been decided by the Pacific Electric Company to extend its Santa Ana-Tustin line to Irvine.

SALT LAKE CITY, UTAH.—The name of the Salt Lake and Ogden Railroad has been changed to the Bamberger Electric Railroad Company.

LINDSAY, CAL.—Lindsay is to get the Visalia Electric Railroad, according to the statement of R. G. Ballard, manager of the road, who was in the city closing up the deal for an option on the right of way tracts. Ballard stated that the last mile and a half, including road and right of way will cost the company about \$65,000, or about double the amount which they expected to pay.

MARYSVILLE, CAL.—Through the efforts of the city council a mutual agreement has been reached between the Northern Electric Company, Yuba Manufacturing Company and the Southern Pacific Company relative to the removal of the former's tracks from Eighth and F streets in this city which connect with the Yuba Manufacturing plant here. The city has granted the Northern Electric Company a franchise to place its tracks on J street from Fifth to Ninth, where it will connect with the Southern Pacific line, giving them access to the Yuba Manufacturing Plant.

ILLUMINATION

SAN DIEGO, CAL.—A resolution of intention to establish the Loma Portal Lighting District has been adopted by the council.

FLAGSTAFF, ARIZ.—The Williams Electric Light & Water Company was practically burned to the ground, with a loss estimated at \$8000.

VENTURA, CAL.—A resolution has been adopted by the board of trustees declaring intention to install ornamental street lighting on Main street.

SANTA BARBARA, CAL.—The public library has let contracts for the lighting equipment for the new library building to the Reynolds Electric Company.

OAKLAND, CAL.—An ordinance has been adopted by the city council for lighting posts and appliances to be installed for lighting of North Broadway.

EL CENTRO, CAL.—At a meeting of the city trustees it was suggested that a municipal lighting system be installed but this met with little favor because of the cost of installation.

WHITE SALMON, WASH.—An ordinance has been passed by the city council granting to the Pacific Power & Light Company, a franchise to run 50 years to operate in White Salmon.

DAVIS, CAL.—The town of Zamora, 14 miles north of Woodland, is to have electric lights if efforts of Supervisor Edson and Fred Shafter, secretary of the board of trade are successful.

LOS ANGELES, CAL.—Plans and specifications for improvement work in the Jefferson Lighting District have been adopted by the board of supervisors and the clerk has been directed to publish a notice inviting bids.

GOLDENDALE, WASH.—The Pacific Power & Light Company has filed with the board of county commissioners of Klickitat County, Washington, a petition asking for a franchise for a period of 50 years in Klickitat County.

LOS ANGELES, CAL.—Another step toward lighting Broadway was taken when the city council instructed the city attorney to prepare an order of intention to install the ornamental system advocated by the Broadway Improvement Association.

CARRIZOZO, N. M.—Street lights are now a certainty for Carrizozo. The mayor has been empowered to make arrangements with the Lincoln Light and Power Company for the installation of steel poles and proper lights to sufficiently light the town.

SAN FRANCISCO, CAL.—J. T. Mabey has filed with the superior court an opposition to the petition of the Halfmoon Bay Light and Power Company for permission to dissolve. He claims all the corporation's liabilities have not been met, as is alleged in the petition.

PROSSER, WASH.—At the last meeting of the city council the Prosser Power & Light Company presented a new 50-year franchise to be considered by the council as the franchise for lighting which the company is now operating under expires November 1, 1917.

HANFORD, CAL.—At a meeting of the board of supervisors a petition was filed in the office of the county clerk asking the formation of the assessment district to provide a lighting system for the town of Stratford, to be known as Stratford Lighting District of Kings County.

SAN MATEO, CAL.—The Pacific Gas & Electric Company has started 200 men installing electric lights numbering between 80,000 and 50,000 at Camp Fremont at Menlo Park. The contract which was secured by the company is one of the largest that has been let for electric power.

ARCATA, CAL.—The general manager of the Western States Electric Company states that preparations have been under way for some time past for making changes in light and power circuits in Arcata. Many of the changes will re-

quire new and larger poles and so extensive are they that it almost means the rebuilding of the entire system.

SAN BERNARDINO, CAL.—A committee has been appointed by the mayor to take charge of negotiations with power companies and to recommend the method by which appraisement may be made on the properties to further a municipal electric lighting project. The members of the city council declared at a meeting a few days ago that sentiment seemed to favor municipal lighting.

TELEPHONE AND TELEGRAPH

SUNNYSIDE, CAL.—The city council at its last meeting passed an ordinance granting to the City Telephone Company a franchise to do general telephone business in the town of Sunnyside.

MONTEBELLO, CAL.—The Union Oil Company of California has made an application to the board of trustees for the establishment of a telephone line here, and the company also asks for a permit to begin work on the building of the line immediately.

SACRAMENTO, CAL.—The Home Telephone Company of Los Angeles has applied to Commissioner of Corporations H. L. Carnahan for authority to distribute assets as dividends to holders of preferred and common stock; to settle the indebtedness of the company, and finally distribute the remaining assets.

IRRIGATION

STOCKTON, CAL.—Promoters of the Woodbridge irrigation district are busy preparing new petitions to the board of supervisors on account of the withdrawal of the petition filed about two weeks ago. The petition was withdrawn when it was learned that land included can be eliminated.

SUSANVILLE, CAL.—The contract for the construction work of the Baxter Creek irrigation district dam and canal was let by the board of directors to the Shattuck-Edinger Company of San Francisco. The commencement of the work will have to await the approval of the contractors by the state bond commission, and as soon as this has been received work will be commenced within ten days thereafter.

STOCKTON, CAL.—Drainage engineers from the department of agriculture and soil experts from the University of California are conducting a co-operative demonstration at the Frank A. Guernsey 260-acre ranch on Rough and Ready Island, just west of Stockton. They plan to determine cost data on the installment of an irrigation and drainage system in a typical delta farm and to demonstrate the practicability of such a system.

KLAMATH FALLS, ORE.—The new pumping plant for the Pine Grove Irrigation project has now been installed, and is expected to be in full operation by the first of next week. Six hundred acres are embraced in the district, which has recently been formed by 11 farmers of that section, who will pump the water from the south branch of the United States irrigation canal, near the ranch of S. E. Icenbice, through a half-mile ditch, now completed.

SAN DIEGO, CAL.—Plans for the development of two big water systems in this county and building of a power plant to furnish power for San Diego County and Imperial Valley, have been announced by Edward Fletcher Company. Incorporation papers have been filed for Warner Mutual Water Company, incorporated for \$6,000,000 and the Pamo Mutual Water Company, for \$4,750,000. Incorporators and directors of both companies are William G. Henshaw, Col. Edward Fletcher, W. E. Hodges, E. O. Faulkner and Wm. B. Gross. Warner Company will build a dam at Warner dam site and a power plant from which power will be furnished to a number of companies. Pamo Company will build three dams, one at San Clemente site, at Linda Vista, one at Sutherland site at Ramona and one at Pamo site at San Pasqual Valley.

JOURNAL OF ELECTRICITY

VOL. XXXIX No. 7

SAN FRANCISCO, OCTOBER 1, 1917

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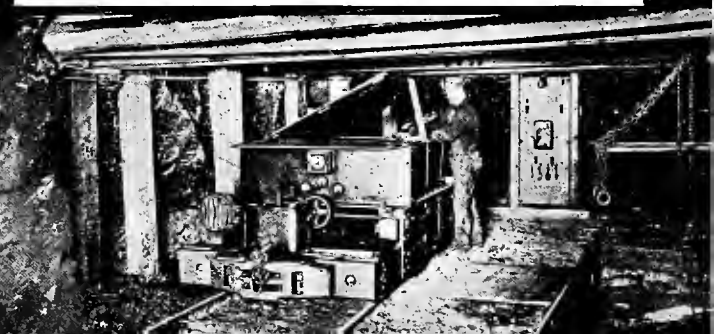
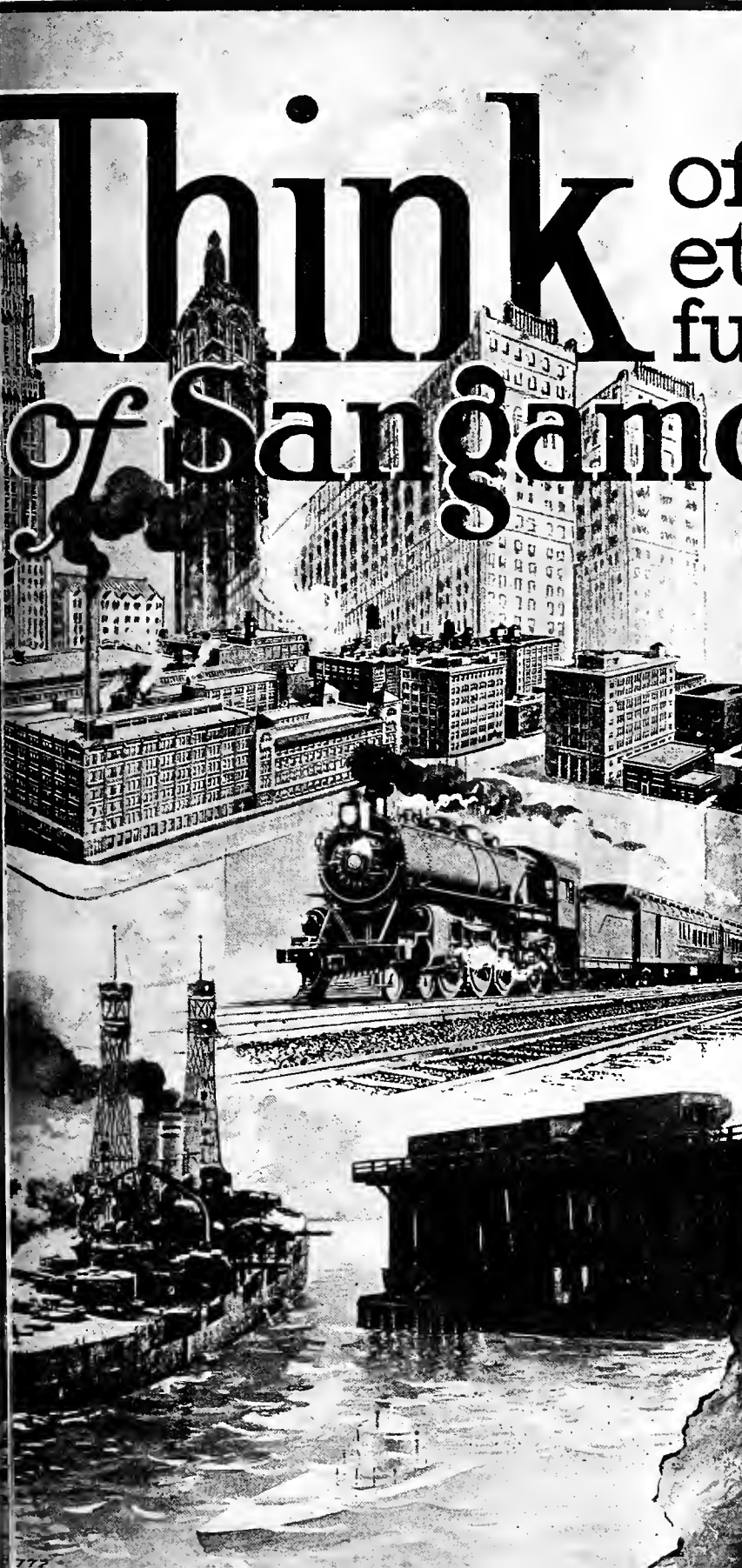
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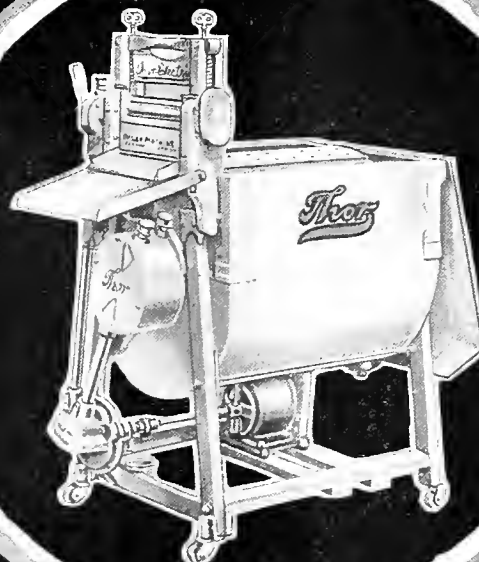
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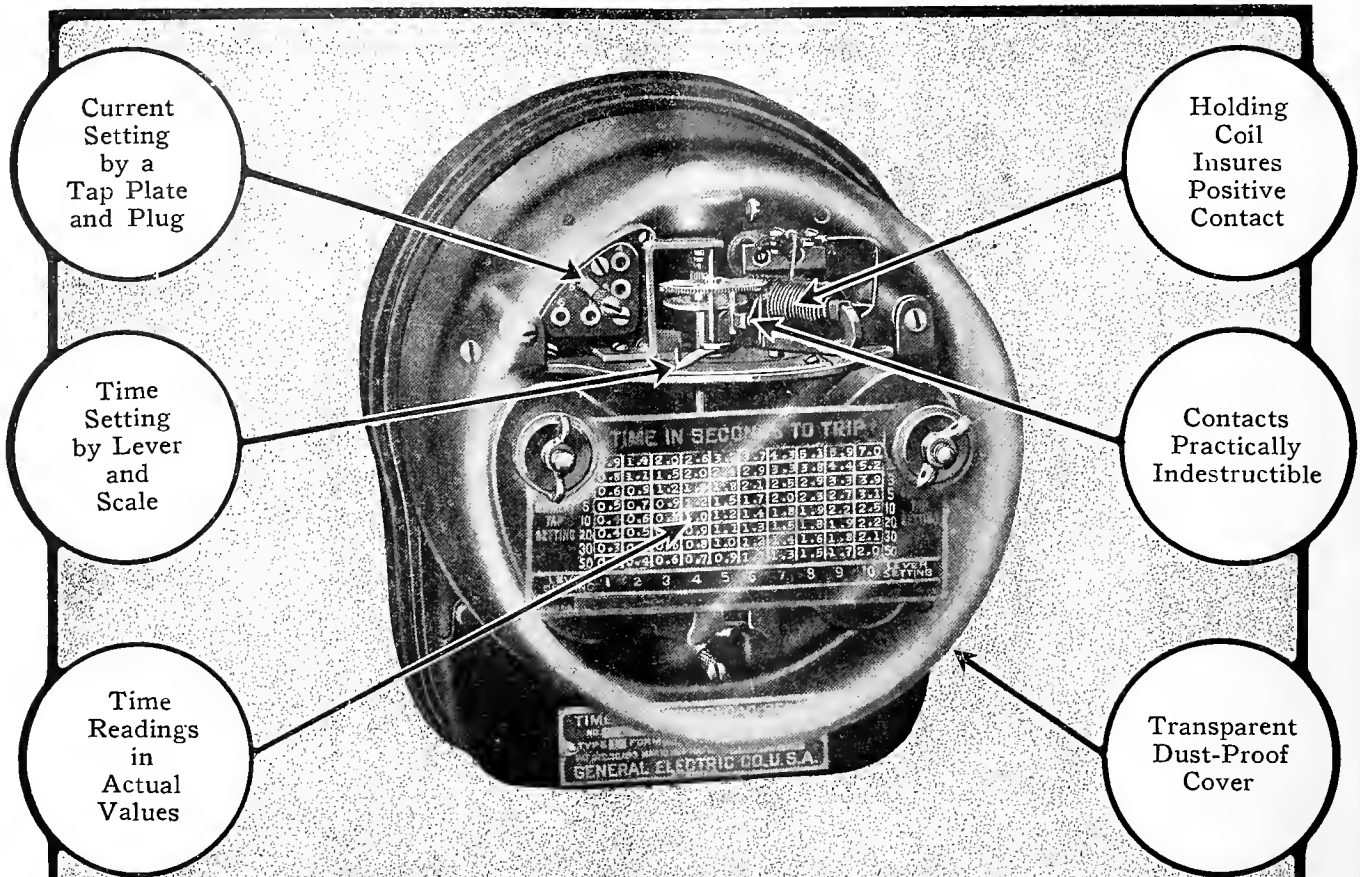
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JOURNAL OF ELECTRICITY



Devoted to the Generation, Distribution and Utilization of Energy

VOLUME XXXIX

SAN FRANCISCO, OCTOBER 1, 1917

NUMBER 7

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SPOKANE'S STEAM HEATING SYSTEM

(The technical details of each new district steam heating system operated in conjunction with a city electric distribution are of interest as an index of the rapid progress which is being made in this field. Herein is given a description of the high and low pressure steam lines serving Spokane, Wash.—The Editor.)

The Spokane Heat, Light & Power Company serves the business section of Spokane, Wash., with steam for heating and with electricity for power and light. The electric current is produced as a by-product of the steam heating system. The plant is situated close to the center of distribution on Post street, adjoining the Northern Pacific Railroad right-of-way, thus facilitating the delivery of fuel.

Steam is supplied at 180 lb. pressure from ten 450 h.p. Wickes boilers equipped with Roney stokers. The fuel is Roslyn coal which is handled automatically from the time it is unloaded from the overhead railway track until the ashes are discharged into overhead ash bunkers. From the track hopper an apron conveyor carries it either directly to the crusher or by-passes it to a skip hoist whence a belt conveyor distributes it to a 1200 ton coal bunker. From this bunker the coal is weighed on travelling scales on either side of the firing alley and then passed into the stoker hopper.

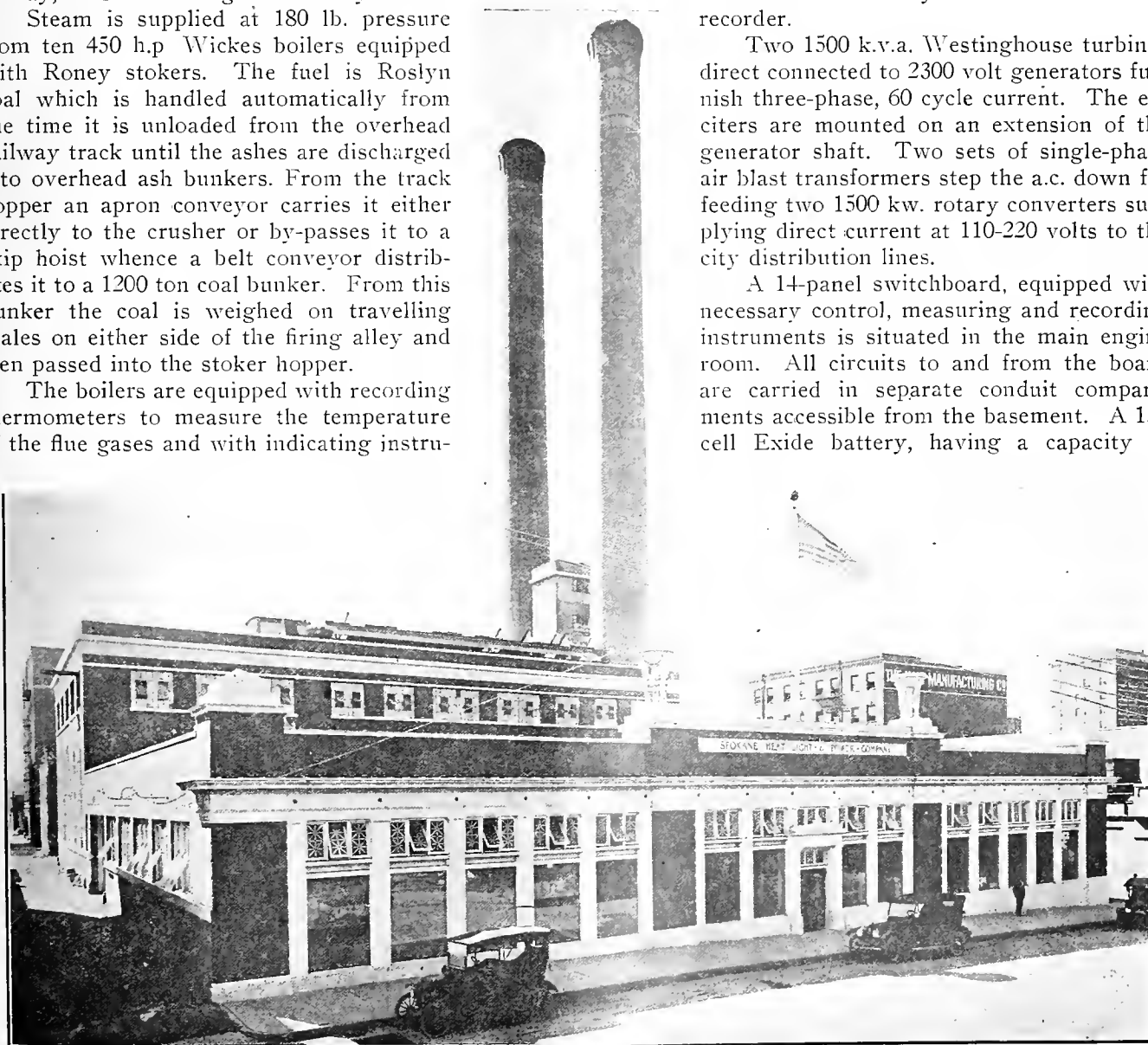
The boilers are equipped with recording thermometers to measure the temperature of the flue gases and with indicating instru-

ments to show the furnace conditions. Two Custodis brick stacks, 220 ft. high and 12 ft. inside diameter at the top, carry off the smoke and create the draught.

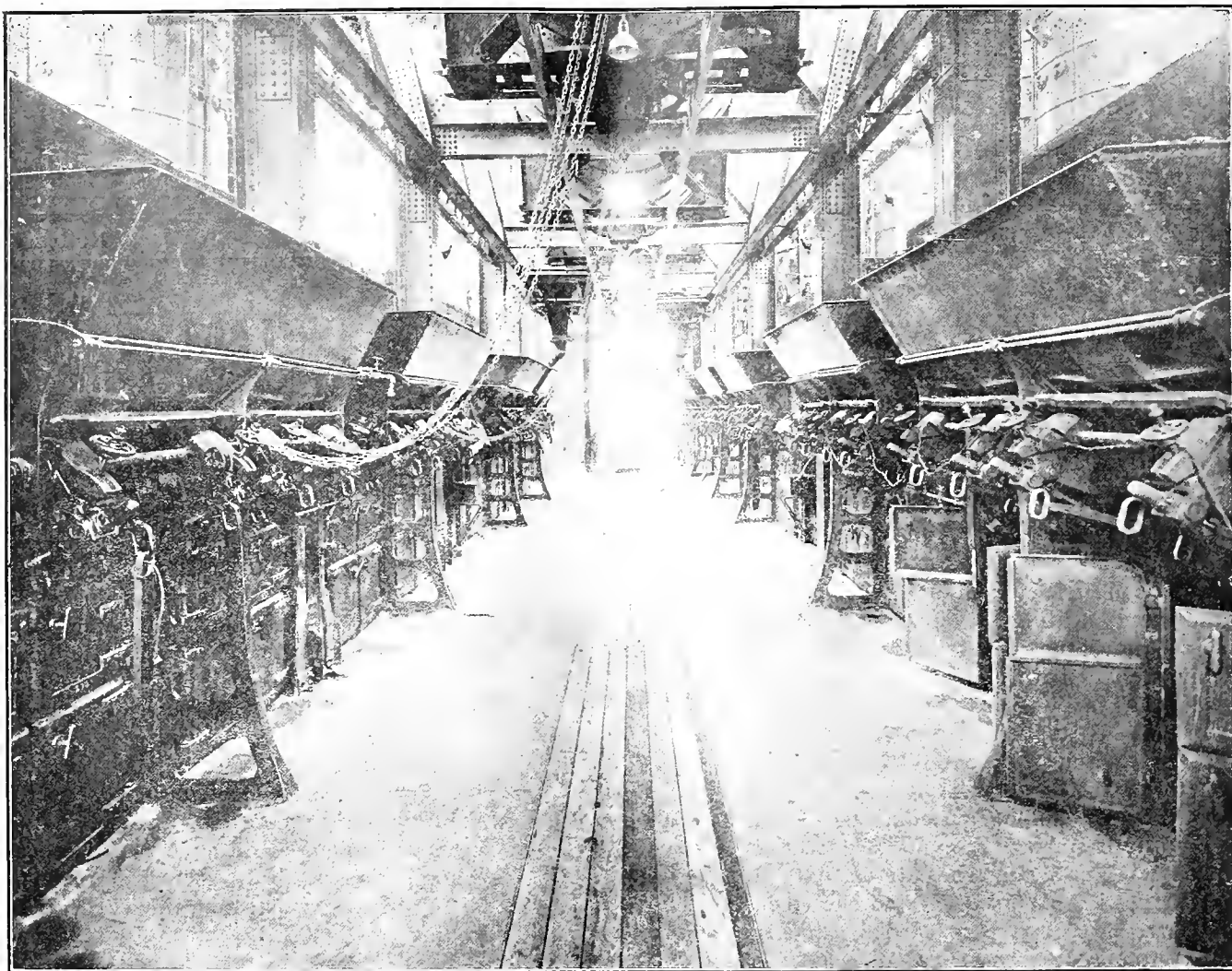
Feed water is obtained from the city mains, chemically treated, and delivered to the feed water heater by two centrifugal pumps driven by Westinghouse turbines. It is then pumped to the boilers after measurement by a Lea V-notch recorder.

Two 1500 k.v.a. Westinghouse turbines direct connected to 2300 volt generators furnish three-phase, 60 cycle current. The exciters are mounted on an extension of the generator shaft. Two sets of single-phase air blast transformers step the a.c. down for feeding two 1500 kw. rotary converters supplying direct current at 110-220 volts to the city distribution lines.

A 14-panel switchboard, equipped with necessary control, measuring and recording instruments is situated in the main engine room. All circuits to and from the board are carried in separate conduit compartments accessible from the basement. A 150 cell Exide battery, having a capacity of



Combined Office and Power Plant Building of Spokane Heat, Light & Power Company



Firing Alley, showing Wickes Boilers and Roney Stokers

1800 amperes at 250 volts for one hour floats on the d.c. bus. It is equipped with end cell switches so that it may be charged from the rotaries through booster sets. This equipment was installed by the Electric Storage Battery Company.

All station lights are in a three wire 110/220 volt circuit supplied through a double-throw switch with booster direct or alternating current. Station power for the operation of the skip hoist, stoker, 1500 ton overhead crane, etc., is obtained from the three-phase 440 volt circuit.

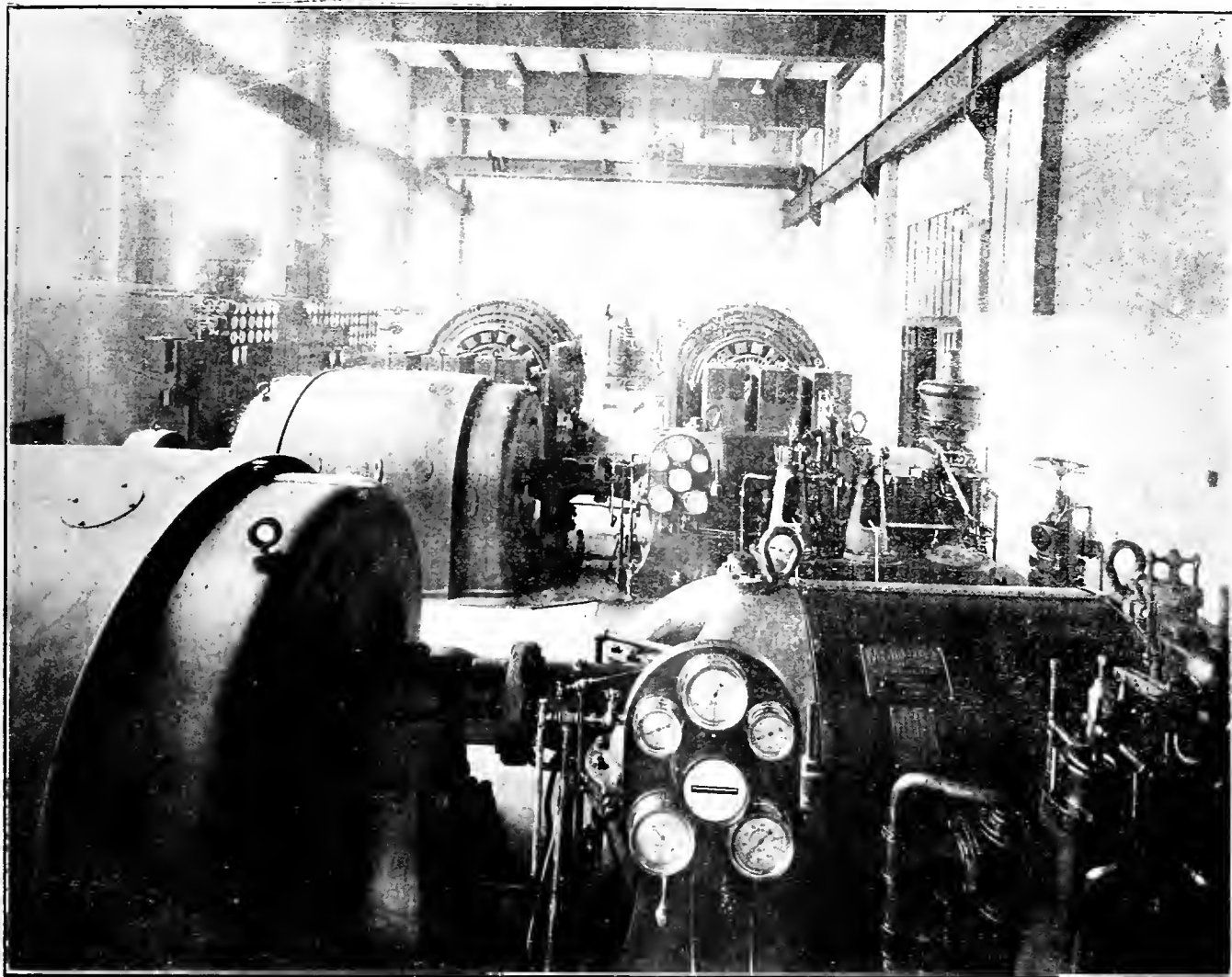
This equipment is housed in a handsome steel frame building with brick walls. The concrete foundations go to bedrock. The property is situated close to the business center of the city and is large enough to allow for a duplication of the present installation. The station and general layout of the electric distribution system was designed by the Arnold Company of Chicago. The steam heating system was designed and installed by the American District Steam Company. The foregoing information was furnished to the writer by Mr. Ludwig Kemper, general manager of the company, and the following constitutes a report by S. B. Clark, superintendent:

District Heating System

The heating system consists of a low pressure system operated at about five pounds pressure, and a

high pressure system operated at approximately 125 pounds. The low pressure system is used generally for building heating purposes, for cooking apparatus and for hot water. The high pressure line serves various power users such as ventilating engines, hydraulic pumps, laundry machinery and apparatus, etc., and also for train line heating at the railway stations.

The low pressure steam supply is obtained from the exhaust of the electric turbines. During such times as this exhaust does not supply enough steam for the heating requirements make up steam is added from the live steam in the power house, being regulated through reducing valves. The main low pressure supply line to the system from the turbines consists of two 36 in. low pressure lines tied together in an open tunnel at the rear of the power house by a 32 in. cross header, feeding the system from both ends, the east opening being 30 in. and the west 16 in. At present only one of the 36 in. supply lines is in use, the other being laid for a future installation of additional generating units. The 32 in. and 30 in. line is all riveted boiler plate pipe set on rollers, the expansion being taken up in these lines by copper Badger expansion joints. The 30 in. line is split at Post street into two 20 in. openings and one 16 in. opening. These openings enter directly into two 20 in. and one 16 in. mains supplying the main part of the steam un-



The Turbine Room

derground system. The 16 in. opening at the west end of the tunnel also leads into the underground main system proper by a loop line.

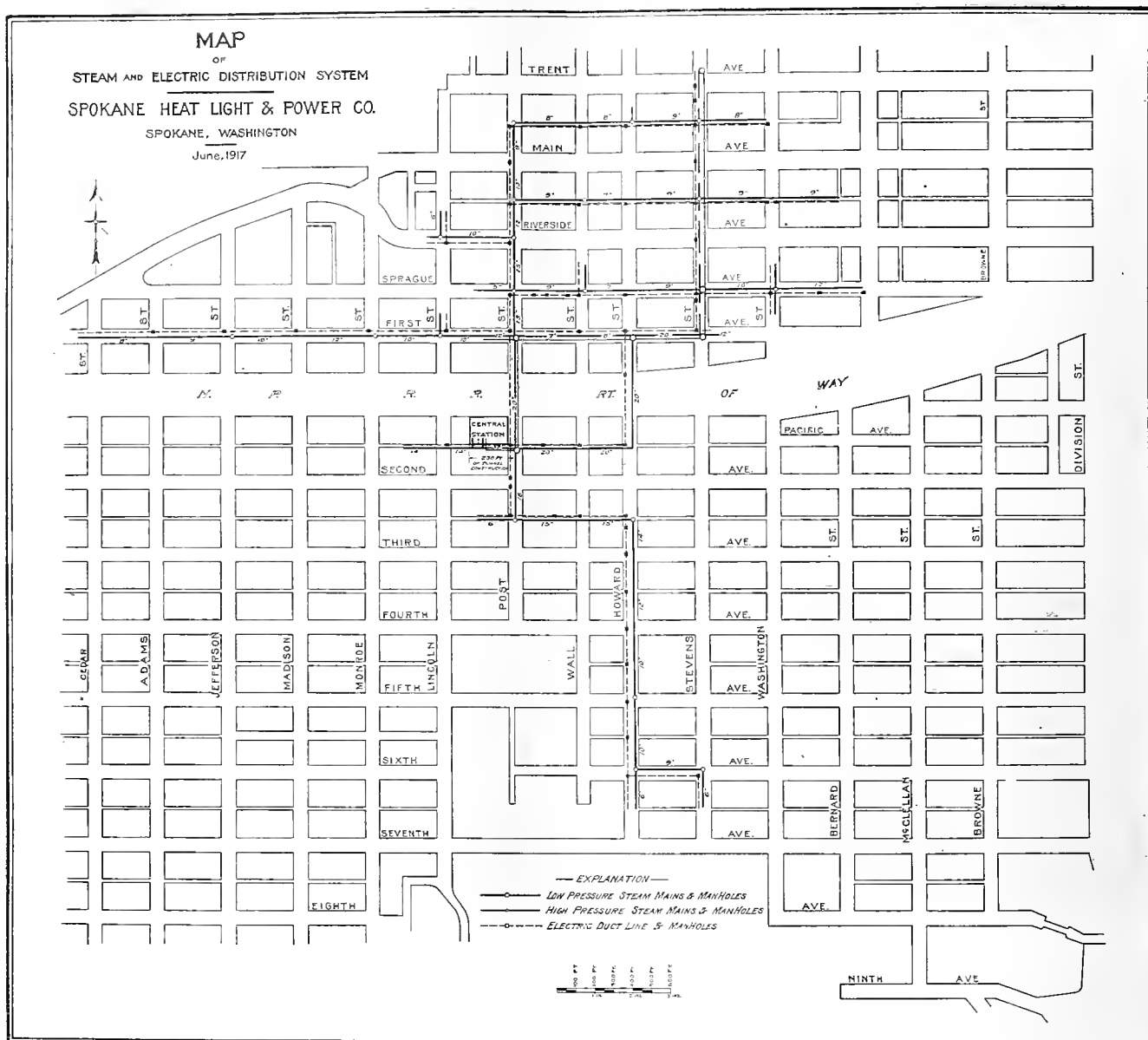
The general plan of the underground steam mains and area covered is shown on the map. Both the low and high pressure steam main system were installed by the American District Steam Company. Their standard variator type of construction was used throughout with the exception of the larger low pressure lines where low pressure double and single slip expansion joints were installed.

The high pressure system covers but a small portion of the total heating area and supplies buildings only for the special cases enumerated above. A 5 in. high pressure line from the power house supplies the high pressure system, later being reduced to 4 in. Slip joints for expansion are used on this line and located in accessible manholes for proper maintenance. Owing to the difficulties of construction and obstructions encountered in the street, it was impossible to align and grade the high pressure system properly. For this reason it was necessary to install a number of high pressure traps, which later on were found to be unreliable, causing a great deal of trouble and maintenance expense. The difficulty was finally overcome by installing small wire drawing by-passes in

the high pressure drainage lines and discharging into the low pressure system. The underground steam system is composed of 20,682 ft. of the different sizes of steam mains.

The underground electric system was installed at the same time as the steam and in most cases was built above and in the same trench. Particular attention was given in the electric underground system to large manholes and service boxes. The Edison three-wire 120-240 d.c. system is installed throughout. Feeder cables are mostly of 1,000,000 c.m. lead covered cable. The mains and neutrals are made of different sizes but unusually heavy. Feeders are tied in solid with the station buss and terminates on the system in manhole type junction boxes and tied to junction box busses with fuses. All mains terminate in junction boxes at each intersection of the cable system and are also tied to busses through fuses. Pilot wire cable was installed on feeder terminal point having a positive, negative, and neutral pilot wire leading back to station switchboard.

The steam service pipe leading to buildings are taken in all cases from the service variator openings. The company installs the service pipe just inside of the building wall and also installs at this service entrance the necessary valves for controlling the in-



Map of Steam and Electric Distribution System

terior steam connections. In some cases this company has found it advisable to do all of the necessary pipe work inside of a building in order to properly connect the existing system with our steam service. We have endeavored in all cases to install piping and apparatus in the buildings so as to give in all respects the most economical service. This interior work covers connections to a great number of different steam heating systems, hot water systems, restaurants, laundries, etc. For the hot water uses in the buildings we manufacture an instantaneous hot water heater and installed so that the temperature of the hot water so manufactured is thermostatically controlled. We are using in all cases cooling coils for the purposes of obtaining all heat from the water of condensation before it is emptied into the sewer. We have endeavored also to economize in steam heating by use of thermostatic controls.

All electric service pipes and cables are connected to the main system at our service boxes. Service cables are all tied in solid. This company furnishes and maintains an ironclad interior service installation. We are also using meter testing blocks.

To Ascertain the "Normal Reading."—An excellent method for ascertaining the normal reading of the steam calorimeter has been proposed by the Power Test Committee of the American Society of Mechanical Engineers. This method is described on page 1415 of Vol. 37, Transactions A. S. M. E. for 1915.

To determine the "normal" reading of the low-pressure thermometer corresponding to dry steam, the instrument should be attached to a horizontal steam pipe in such a way that the sampling nozzle projects upwards to near the top of the pipe, there being no perforations and the steam entering through the open top of the nozzle. The test should be made when the steam in the pipe is in a quiescent state, and when the steam pressure is maintained constantly at the point observed on the main trial. If the steam pressure falls during the time when the observations are being made, the test should be continued long enough to obtain the effect of an equivalent rise of pressure.

THE ENGINEERING COUNCIL

BY IRA N. HOLLIS

(Serious thought has long been given by engineers, looking toward some means of perfecting unified action of all the great national engineering societies in matters of common interest. Here is an article by the president of the American Society of Mechanical Engineers that is worthy the careful consideration of engineers of the West. The engineering council, composed of representatives from the four great national societies, bids well to perform a timely and useful function in the present critical affairs of the nation.—The Editor.)

The formation of an Engineering Council is the outgrowth of a real need for proper consideration of questions of general interest to engineers and to the public, and to provide the means for united action upon questions of common concern. Many such questions have come up in the past and will arise in greater number in the future. This war has brought out very impressively the actual need for united action of some kind. At present the Council is concerned only with four Societies because that seemed the most practical way of getting a group of men together to answer the immediate needs, but these Societies do not assume to speak for all engineering societies in the country. Criticism that they are exclusive in any way is utterly mistaken. There is the hope that such a Council by proving itself effective may lead to much wider co-operation in a strictly representative body for all engineers, and thus pave the way for a very much larger union in the future.

How can the Council be enlarged? By a union of all Societies either as the outgrowth of the present Council or by a congress of engineers leading to united action by all Societies. The first method will be the most natural one because many local societies and national societies also have a large membership in the four societies at present concerned. We have three classes of engineers to reach: first those who are members of local societies and not members of national societies; second, those who are members of national societies and not members of local societies, and third, those who are members of no society. The last named class constitutes a very large number in our profession. We are almost as mixed as American citizenship and we suffer therefrom just as much as America with a population representing every race and every people in Europe. There can be no question of the enormous advantage of union. That union should be completed by strengthening the existing agencies and not by the formation of new societies. The national societies are thoroughly national notwithstanding an occasional complaint that they are run by New York. If they have not been able to express the democratic spirit of our country as fully as might be desired it is the fault of the members in all the states and not of the city in which the principal offices are located.

The four societies concerned at present are the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers. They have come together in pairs from time to time in the past for special purposes and there have been general conferences on subjects requiring immediate settlement, but until the Council was definitely organized in June there was no permanent body to advise all the Societies. We have had many fruitful discussions in the past leading to

useful action. The Standardization Committee which has been organized to represent five Societies has passed upon commercial standards of all kinds. This committee has great possibilities and it should be enlarged enough so that its influence may become very widespread.

Many problems have already been presented before the Council. Its personnel made up of twenty-four men representing equally the four societies is well balanced and judicial. The first duty was necessarily the organization and appointment of standing committees which have already been reported in the press. They might with advantage be mentioned here:

1. Committee on Public Affairs, comprised of Messrs. C. W. Baker, G. F. Swain, S. J. Jennings and E. W. Rice.

2. Committee on Rules, comprised of Messrs. J. P. Channing, Clemens Herschel, N. A. Carle, and D. S. Jacobus.

3. Committee on Finance, comprised of Messrs. B. B. Thayer, I. E. Moulthrop, Calvert Townley, and Alex. C. Humphreys.

Certain questions relate, however, to the war and the assistance that engineers can render. A committee to be called the American Engineering Service Committee was appointed with instructions to invite the co-operation of all engineering societies. This committee in the first instance consists of A. D. Flinn of the Civil Engineers, A. S. McAllister of the Electrical Engineers, George J. Foran of the Mechanical Engineers, G. C. Stone of the Mining Engineers and E. B. Sturgis of the Mining and Metallurgical Engineers. Its present duty is the tabulation and listing of the members of the five societies represented, in order that we as a profession may be in a position to take a larger part in the industries after peace is declared. This tabulation has already in part been done, but in a rather unsystematic and unequal way. It is hoped that the new committee by having additions from other societies may make a final and lasting tabulation of all the engineers in the United States. The list is to be kept in the Engineering Building for general use in government problems and in the industries. At present the committee is devoting its attention to the immediate need of the hour, namely, the procurement of men for special service in the government. A list of specialties in the societies has already been completed. There are three methods by which engineers may enter United States Service; first, through some organization, second, through individual application to a department of the government, and third, through selection by the Conscription Law. But this is War Service wholly and not Civil Service which is the same now as it has always been. As a matter of fact a great many engineers have already entered through the engineering societies, through colleges

and through various special boards in Washington. The importance, however, of a complete list of engineers and their professional specialties cannot be overrated. Such a complete list can be made only with the help of the local as well as of the national societies. The committee mentioned above is organized with George J. Foran as chairman and A. S. McAllister as secretary. All societies should respond to the request for co-operation.

Another committee of which Harold W. Buck is chairman is called the War Committee of Technical Societies. The members are Messrs. H. W. Buck, A. M. Greene, R. N. Inglis, C. R. Corning, G. C. Stone, D. W. Brunton, J. M. Boyle, J. V. Davies, Joseph Bijur, A. S. McAllister, W. D. Richardson and Charles Baskerville. It was appointed to assist any organization in Washington, such as for instance, the Council of National Defense, the National Research Council and the Naval Consulting Board, in any way in which it can bring to the attention of the engineers of the country the necessity for thought and help in the numerous problems that arise. A Council organized by the enlargement of the present Engineering Council can be very effective in many ways, without interfering with the autonomy of any individual society. Every society has some definite purpose of its own and also some which it holds in common with all other societies. One of the latter purposes relates to public service and to co-operation. To the end that all societies may understand fully their opportunity, the committee of which Mr. Foran is chairman has made a complete list of all the societies and their officers and communications will be sent out inviting co-operation and it is hoped that the Council may be successful in arousing sufficient interest to bring about a larger and better Council for all engineers.

In organizing the council provision was made for the election to membership of other national engineering and technical societies. There is no doubt that rules can be made under which these societies may become members. This will involve consultation and discussion in the future.

The office of the Council will be in the Engineering Building, 29 West 39th street, New York City.

THE TRIUMPH OF ELECTRICITY

At the annual general meeting of the Waverley Association of Gas Managers, held in Edinburgh recently, Mr. J. D. Keillor (Hawick), the president, in the course of his address, said the opposition of electricity was so formidable that if gas was to maintain an honorable position in the realm of light and power they would have to apply a driving force so great and of such endurance that their place would be for ever assured, and that gas would be a force to be reckoned with. They should remember that they were not monopolists in the supply of light and power. Their rival had received all the care and support that scientific thought and influence could bestow upon it, and speaking generally, had enjoyed an amount of patronage and encouragement never bestowed upon gas. To what extent, it might in future be developed was a matter of speculation, but he felt sure that soon its opposition would be more formidable than ever. Their

attention had been directed to a movement in which the board of trade was taking an active part—the proposal to link-up electric supply undertakings in certain industrial centers.

A NEW USE FOR THE ELECTRIC FAN

In outlining a campaign for selling electric fans and building up the fan load, it will be interesting and instructive to first write to the division of publications, Department of Agriculture, at Washington, and secure a free copy of bulletin 841, which, among other things, has to say:

It has been found that many sliced vegetables and fruits placed in long trays 3 by 1 foot and stacked in two tiers end to end before an electric fan can be dried to the requisite dryness within 24 hours. Some require much less time. For instance, sliced string beans and shredded sweet potatoes will dry before a fan running at a moderate speed within a few hours. In many cities the electric fan will cost not more than one-fourth of a cent an hour to run. The fan should be placed close to the stacks of trays, and they should not be filled so full that the air can not pass freely through them. The fan method has a marked advantage in that product keeps cool owing to evaporation while it is being dried, thus tending to retain the color and eliminate spoilage.

NEW ELECTRICAL USES IN THE RECOVERY OF RARE METALS

The U. S. Bureau of Mines in technical paper 177 has just published an interesting account of the preparation of ferro-uranium. The results of the study are presented in the belief that they will be of aid in developing the use of ferro-uranium, particularly in the manufacture of special steels.

In summarizing the bulletin it appears that by using a pure UO_2 , a low-ash coke or charcoal, and a pure iron as raw material, with CaF_2 as slag former, and using a tilting direct-arc type of furnace with water-cooled magnesite hearth and sides, it should be possible to produce commercially, without a second refining operation, ferro-uranium of any desired content, say 40 to 70 per cent, with a carbon content averaging less than 2.0 per cent, a silicon content of less than 0.75 per cent, a vanadium content of less than 0.5 per cent, and with aluminum, sulphur, phosphorus and manganese contents all so low as to be negligible.

The power consumption should be decidedly less than 3 kilowatt-hours per pound of alloy. The loss of U in the reduction process should be less than 15 per cent.

If experiments show that uranium steels high in uranium are not valuable, but that a little uranium in steels is useful, and if the amount required is so low that the carbon introduced by a high-carbon alloy is harmless, then the furnace might have an uncooled carbon hearth, and the alloys would contain 4 to 5 per cent carbon.

If uranium is found useful only as a deoxidizer or scavenger of oxygen and nitrogen, aluminum would not be harmful and might be advantageous, and the slag former might be wholly or in part Al_2O_3 .

HYDRO-ELECTRIC ENERGY AS A CONSERVER OF OIL

(The strongest argument for the immediate need of Federal legislation encouraging the development of water power is found in this extract from the report of the Petroleum Committee of the California Council of Defense. Incidentally it also presents a comprehensive survey of power conditions on the Pacific Coast.—The Editor.)

The possibility of the further conservation of California petroleum and its products through a more extensive and efficient utilization of hydroelectric energy, both during the war and thereafter, has been carefully considered by the Petroleum Committee of the California State Council of Defense. The committee has had the benefit of two special reports dealing with the general problem, the one received from the Pacific Coast Section of the National Electric Light Association over the signature of Mr. H. F. Jackson, president, and the other from Mr. F. Emerson Hoar, gas and electrical engineer of the California Railroad Commission.

The problem of conserving fuel through the substitution of water power is not a new one in California and other Pacific Coast States, as will be apparent from the fact that hydroelectric development in California has increased 800 per cent in the last fifteen years. It is interesting to note that during the same period the production of petroleum increased less than 700 per cent.

The total installed capacity of existing hydroelectric plants in California, Washington, Oregon, Nevada and Arizona is about 1,288,600 horsepower, of which 731,000 horsepower, or 56.8 per cent, is in California. The combined output of these hydroelectric plants, if reproduced by steam power, would require the annual expenditure of not less than 19,000,000 barrels of fuel oil.

The minimum potential water power resource of California, according to estimates made by the U. S. Geological Survey in 1908, as revised by the Commissioner of Corporations in 1912 and by the Secretary of Agriculture in Senate Document No. 316, Sixty-fourth Congress, first session, is 3,424,000 horsepower, and the minimum combined resources of the five states mentioned is reported to be 12,619,000 horsepower, or 45 per cent of the water power resources of the entire country. Of these potential resources, approximately one-third can be developed as required at an average investment cost which will permit of successful and profitable operation under present conditions of the western power market. This information, over a ten-year period, is shown herewith for fifteen years, from 1902 to 1917, segregated by states:

Water Power Resources and Hydroelectric Development of Pacific Coast States in Horsepower

Item	California	Oregon	Washington	Nevada	Arizona	Total
Minimum potential water power resources	3,424,000	3,148,000	4,928,000	172,000	893,000	12,619,000
Estimated practical developments under present conditions ..	1,100,000	950,000	1,200,000	20,000	280,000	3,550,000
Installed capacity of hydroelectric plants—						
1902	91,656	31,089	24,089	2,296	320	149,450
1907	216,150	138,779	67,714	6,812	934	430,389
1912	440,243	168,807	279,760	12,709	9,346	910,865
1917 (estimated) ..	731,000	176,800	333,600	13,500	33,700	1,288,600

The vast water power resources of California and other states now consuming California petroleum and

its products are of particular interest at this time because of the present critical situation affecting the supply of liquid fuels. The only relief, however, which may be anticipated from this source during the war will come from a more complete and efficient utilization of existing hydroelectric capacity.

At the present time over 21,500 horsepower of developed hydroelectric plants in California are not available for use in the industrial centers of the state, because of inadequate line capacities and lack of proper interconnections between the systems of the larger producing companies. The annual output capacity of this excess power is equivalent to about 668,500

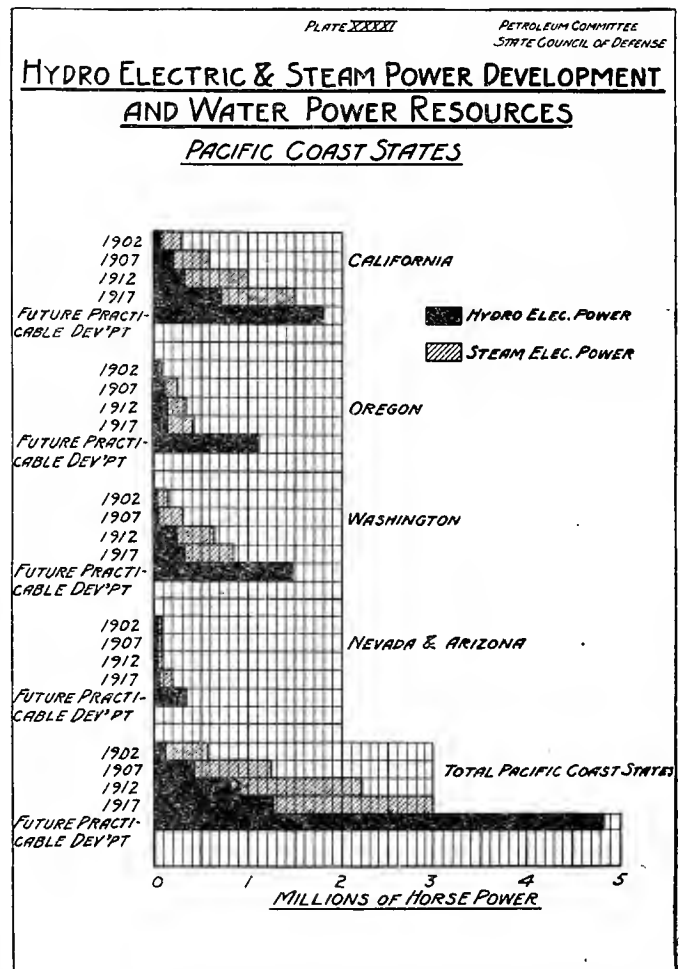


Chart of Pacific Coast Power Resources

barrels of fuel oil. In addition to the unavailable actual excess capacity in hydroelectric plants of the individual companies operating in this state, the failure to take advantage of the diversity between the system peak loads of these various companies and the inability at the present time to utilize fully the stream flow at the separate plants because of the lack of interconnections between the individual transmission systems, represent a waste of electric energy, which is equivalent to not less than 1,100,000 barrels of fuel oil annually. Adequate and proper intercon-

nections between the larger independent transmission systems would remedy this situation.

The present installed capacity of public utility and industrial steam power plants in the five Pacific Coast states hereinbefore mentioned is about 1,729,600 horsepower, of which total approximately 804,900 horsepower is installed in California.

The present fuel oil consumption of these steam power plants is at the rate of about 9,770,000 barrels per year, of which amount some 3,950,000 barrels are consumed in California outside of the oil fields.

Steam Plant Installation in Pacific Coast States, Public Utilities and Industrial Establishments, in Horsepower

Installed capacity	California	Oregon	Washington	Nevada	Arizona	Totals
1902	220,937	59,404	140,110	1,156	16,498	438,105
1907	397,986	114,132	263,016	3,392	34,973	813,499
1912	664,987	196,112	393,276	8,808	56,787	1,319,970
1917 (estimated)	804,900	267,800	522,000	22,400	112,500	1,729,600

Railroads at the present time consume approximately 33,996,000 barrels of California fuel oil per annum, of which amount about 24,790,000 barrels are consumed by railroads in California and other Pacific Coast states.

In addition to the plants consuming California fuel oil, stationary internal combustion engines are relatively larger users of gasoline and distillates. The capacity of these engines installed in manufacturing establishments in the five Pacific Coast states is at the present time approximately 17,980 horsepower. These installations have decreased continuously during the last ten years.

Gas and Oil Engine Installations in Pacific Coast States, Public Utilities and Industrial Establishments, in Horsepower

Installed capacity	California	Oregon	Washington	Nevada	Arizona	Totals
1902	10,111	475	1,218	262	2,120	14,186
1907	27,788	667	1,776	965	1,833	33,039
1912	13,832	906	1,764	1,266	1,115	18,883
1917 (estimated)	13,000	1,010	1,750	1,440	780	17,980

While the greatest individual saving in fuel oil would be realized through the electrification of the mountain divisions of steam railroads in California over the Siskiyou, Sierra Nevada, and Tehachapi grades, this is a matter for the future rather than one which can be counted upon to relieve the present situation. Such a comprehensive plan for the substitution of hydroelectric energy for fuel oil could not be carried out immediately and the benefits resulting from such a change would, if immediate steps were taken to begin construction, not be realized for from two and a half to three years. The saving in fuel oil by the electrification of the mountain divisions of the principal railroads would be from 3,200,000 to 3,800,000 barrels per year. The expense involved in making the change would be from \$17,500,000 to \$20,000,000.

Viewing the matter from a practical standpoint, the only early relief which can be anticipated from a greater use of hydroelectric energy will result from the interconnection of the more important electric transmission systems, thus making usable a larger proportion of the available developed water power. This additional energy if utilized for power purposes, both in the steam plants and those of industrial users of fuel oil, will permit the almost immediate conservation of approximately 1,500,000 barrels of fuel oil per year.

The substitution of electric power for that produced by internal combustion engines accessible to existing electric distribution lines in California would, in all probability, effect an annual saving of about 550,000 barrels of gasoline and engine distillate, but in order to fully accomplish this result it would be necessary to develop considerable additional power, which presumably will not be practicable during the war because of the impossibility of obtaining prompt delivery of electrical equipment and the time required to develop hydroelectric properties.

Relative Prices of Fuel Oil and Coal

Whether fuel oil or coal will prevail as a fuel would ordinarily depend upon the play of well known economic forces, among which are the relative price of the two fuels, bearing in mind their relative efficiency, and the convenience of their respective use.

Pacific Gas & Electric Company, which company has made a careful study of this subject, reports to us that the average heating value of coal heretofore sold in California and adjacent states, and produced in Colorado, New Mexico, Washington, Wyoming and Utah, has been approximately 11,933 British thermal units per pound of dry coal. Assuming a boiler efficiency of 65 per cent, 7150 British thermal units would be available from this coal. California fuel oil has a heating value of approximately 18,500 British thermal units per pound and can be burned with an efficiency of 75 per cent, so that the boilers absorb 13,870 British thermal units from each pound of oil. Consequently, one pound of fuel oil is equal, for steaming purposes, to 1.94 pounds of coal of the character hereinbefore referred to. One ton of this coal, containing 2000 pounds, would therefore be equivalent to 3.07 barrels of oil, or approximately three barrels.

The price of California petroleum of between 14 and 17.9 degrees Baume gravity is now 98 cents per barrel at the wells, and \$1.45 per barrel delivered on San Francisco Bay. The price of coal at San Francisco is indefinite at the present time. Coal dealers report that they are securing between \$10 and \$11 per ton for small quantities. Assuming, merely for the purpose of the illustration, that coal could be secured at San Francisco in large quantities for \$8 per ton, fuel oil would have to advance to \$2.66 per barrel before it would be equivalent in price to coal.

It is evident that at the present relative prices of fuel oil and coal in California, few consumers of fuel oil will voluntarily give up its use and revert to coal if they can have an assurance of a continued supply of fuel oil.

PORCELAIN ELECTRICAL SUPPLIES SHOW LARGE INCREASE

The value of porcelain electrical supplies marketed in the United States in 1916 was \$7,034,420, an increase of \$2,363,218 over 1915, according to the United States Geological Survey, Department of the Interior. These wares were reported from 10 states, of which Ohio was the leader, reporting wares to the value of \$2,181,026. New Jersey was second, with \$1,674,093, and New York, third, with \$1,623,433. These three states reported 78 per cent of the value of the entire output.

DEPARTMENT OF THE INTERIOR
FRANKLIN K. LANE, Secretary
BUREAU OF MINES
V. A. H. MANNING, Director

COMPILED BY
DR. YANDELL HENDERSON

RESUSCITATION

FROM GAS ASPHYXIATION, DROWNING, AND ELECTRIC SHOCK

GAS ASPHYXIATION.—Remove the victim from the poisonous atmosphere. If he is still breathing, administer oxygen from a tank with a bag and mask for 20 minutes. If he is not breathing and his jaws are locked so as to interfere with effective artificial respiration, pry them open and wedge with a piece of wood, and remove any foreign body from his mouth. Then give artificial respiration as shown below.

DROWNING.—As soon as the victim is taken from the water place him face downward, clasp your hands under his stomach, and lift him several times, letting his face hang down so as to drain his mouth and throat. Remove from his mouth any foreign body (tobacco, false teeth, or gum). Do not stop to loosen his clothing. Do not carry him any distance. Do not wait for a doctor. Treat him yourself as shown below.

ELECTRIC SHOCK.—With a single quick motion free the victim from the current. Use any *dry* nonconductor (clothing, rope, board) to move either the victim or the wire. Don't take hold of the live wire, and beware of using metal or any moist material. Send someone to shut off the current. If the victim is not breathing remove from his mouth any foreign body. Then give artificial respiration as shown below.

Begin Artificial Respiration at Once

Lay the victim on his belly with his face to one side so that his nose and mouth are free for breathing. Place the victim's arms and hands exactly as shown in figs. 1 and 2, one arm straight out beyond his head, the other under his head. This position is important as it helps to expand his lungs. In drowning cases have the head a little lower than the body.

Kneel, straddling the victim's thighs and facing his head, rest the palms of your hands on his loins (on the muscles of the small of his back), with your thumbs nearly touching each other and with fingers spread over his lowest ribs (see fig. 1).

With arms held straight, swing forward slowly so that the weight of your body is gradually, but *not violently*, brought to bear upon the victim (see fig. 2). This act should take about two seconds.

Then, leaving your hands in place, swing backward slowly so as to remove the pressure, thus returning for two seconds to the position shown in figure 1.

Repeat deliberately 16 to 20 times a minute the swinging forward and backward—a complete respiration in about four seconds. Keep the movements in time with your own breathing.



Figure 1

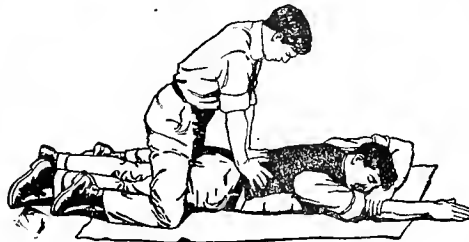


Figure 2

This chart shows the Schaefer, or prone, pressure, method of artificial respiration, as adopted by the Committees on Resuscitation from Mine Gases and Electric Shock, which were appointed by the United States Bureau of Mines, the National Electric Light Association, the American Institute of Electrical Engineers, and the American Medical Association. These committees included

Prof. W. B. Cannon, Prof. Vandell Henderson, Prof. Joseph Erlanger, Dr. George W. Crile, Dr. S. J. Meltzer, Dr. E. A. Spitzka, Mr. W. C. L. Egan, Dr. E. A. Kennelly, Mr. W. U. Weaver, and Dr. Elhu Thompson.

Copies of this chart may be obtained on application to the Director of the Bureau of Mines, Washington, D. C.

Every Moment of Delay is Serious.

While the artificial respiration is being continued, have an assistant draw forward the victim's tongue, if it has fallen back (fortunately it usually falls forward when the victim is face down). Hold the tongue out if it tends to draw back, by wrapping a handkerchief around it. The handkerchief may also protect the assistant's fingers from being bitten. The assistant should also loose any tight clothing around the victim's neck, chest, or waist.

Do not permit bystanders to crowd about and shut off fresh air. Keep the victim warm with proper coverings and by placing beside his body hot bricks, bottles, or rubber bags filled with warm (not hot) water. Wrap bricks, bottles, or bags so as to prevent burning the victim.

Continue the artificial respiration *without interruption* until natural breathing is restored, or for at least three hours. If natural breathing stops after being restored, use artificial respiration again.

Do not give any liquid by mouth until the victim is fully conscious. Keep the victim flat. If after being partly resuscitated he must be moved, carry him on a stretcher. It is dangerous to make an ill person, or one injured in any way, sit up or stand. To make him walk may cause his death.

Don't Wait For an Accident. Learn How to Revive Your Partner by Practicing on Him Now, and Let Him Practice on You.

NEW CHART ON RESUSCITATION

The Bureau of Mines has just issued a chart on the subject of resuscitation from gas asphyxiation, drowning and electric shock. This chart is suitable for posting at the mines, in police and fire stations, bathing houses, and all industrial establishments in which there is danger from gas asphyxiation, drowning or electric shock.

This chart shows the Schaefer, or prone, pressure method of artificial respiration, which is the latest and most approved method advocated by eminent physiologists of the country.

The bureau is issuing this chart in the hope of inducing the adoption of this standard method of resuscitation throughout the country and with the hope that the instructions presented on the chart may result in the saving of human life.

Copies of this chart will be sent free of charge to all persons requesting it as long as the edition remains in stock.

EXTENSION OF STAVANGER ELECTRO-STEEL WORKS

Engineers of the West who have been following with close attention the increased activity in electrochemical development on the Pacific Coast will note with unusual interest recent progress in Norway.

The services of an American expert have been employed to design the new rolling mill that the Stavanger Electro-Steel Works will shortly install. This company has since the new year increased its capital

from about \$300,000 to over \$1,000,000. The company was established in 1913, declared a 7½ per cent dividend in 1915, besides paying up the expenses of organization, and has since prospered to such a degree that the recent expansion was considered advisable.

Most of the company's product sold to date has been in the form of raw blocks. The quality of the steel has found favor. The plan is to double the production by installing electricity in the factory and to turn out a finished product by putting in the rolling mill.

That the company may be quite independent of imported fuel, it has taken over the shares in a power company located near it. This company obtained an 80-year concession in 1900 for the development of the Jorpeland water course. This course when fully developed can deliver 12,000 to 14,000 horsepower. Of this, 1600 horsepower are already in use and 5600 are under completion for the steel works.

The new alternators will cost in the neighborhood of \$777,200, as follows: Smithpress with rolling mill, electric machinery, buildings, etc., \$368,500; electric steel ovens, coupling stations with buildings, connections, etc., electric generators, power transmitters, electric heating ovens, etc., \$214,400; extension of laboratory with equipment, \$33,500; shares in power company, \$93,800; workers' homes, ground and buildings (married workers are to have their own homes), \$67,000.

Attempts have been made to get American connections for the purchase of some of the installations.

THE MARVEL OF THE TELEPHONE

BY J. F. GREENAWALT

(Seldom has the romantic side of an engineering development been more interestingly portrayed than in this fine piece of writing. The paper was presented at the 1917 meeting of the New Mexico Electrical Association. The author is associated with the Mountain States Telephone and Telegraph Company at Denver, Colorado.—The Editor.)

The telephone is surrounded by such an atmosphere of mystery and possesses such marvelous powers that it inspires in me a feeling approaching reverence. The tremendous influence which the little instrument has upon human activity fascinates me and holds me in its spell. How does it gather up the sound of my voice, transmit it in silence to a distant point, and there faithfully reproduce it with every accent, every inflection complete? I don't know. The inventor himself doesn't know. Can anything be more mystifying? I place my lips close to a thin metal disc and speak. The metal disc vibrates. An electric current picks up the vibrations and carries them across the city or across the continent, and my friend hears and understands. My part in the operation is simple, my friend's part is not complex, but the part played by the metal disc and the electric current has never yet been written. Mysterious, wonder-working, fascinating it is, and today wholly indispensable in business.

The story of the birth of the telephone in 1876 and its development from a crude contrivance, generally regarded as a toy for the pastime of the rich, into an actual commercial, household and social necessity, reads like a romance as alluring and as wonderful as a chapter out of the Arabian Nights entertainment.

After years of experimentation, during which time he was often hard pressed for funds sufficient to keep him supplied with food, Alexander Graham Bell succeeded in transmitting the sound of the human voice over a wire. It was on March 10, 1876, that the telephone first talked, and it has been talking ever since.

But no child of an inventor's brain ever had a more desperate struggle for existence, and no inventor ever experienced darker days. For eleven years after the telephone first spoke, Bell and his few loyal friends who believed in him and had faith in his invention, endured poverty, struggles, discouragement, ridicule, court wars and battles for commercial recognition. At first scientists were interested only as it presented a new problem for the laboratory; newspapers condemned it; the public made fun of it; the commercial world derided it; and business men would have none of it. Gradually, however, the utility of the telephone intruded itself upon the consciousness of the commercial world, and its popularity grew by leaps and bounds.

It is interesting to note how apparently trifling circumstances sometimes develop into powerful factors in important events; and to note, too, how, often it is wise to act upon a woman's intuition. Bell's experience was a case in point. At the time he was making his experiments, Bell was conducting a "School of Vocal Physiology" in Boston. This was a school for deaf mutes whom he taught what he called "visible speech." One of his pupils was Mabel Hubbard, daughter of Gardiner G. Hubbard, the latter becoming Bell's chief supporter. The teacher lost his

heart to this gentle, lovable girl, and some years afterward she became his wife.

Meanwhile, just two months after the telephone had spoken its first word, the Centennial Exposition at Philadelphia was opened. By a fortunate chance Hubbard was one of the Centennial commissioners, and by his influence a small table was placed in the department of education in a narrow space between a stairway and a wall, and here was deposited the first telephone. Bell had no intention of visiting the exposition. He was too poor. He had neither railway fare nor money for hotel bills. But one afternoon his sweetheart was taking the train for Philadelphia. Bell accompanied her to the depot to say good-bye. Here Miss Hubbard learned for the first time that he was not to go. She coaxed, pleaded and wheedled, and finally insisting that for his own sake he must look after his exhibit, she burst into a passion of tears. That settled the question. Bell sprang aboard the moving train and Miss Hubbard loaned him the money for the trip.

This was on Friday. The following Sunday the judges were to examine the exhibits in the educational section. All day Bell waited to demonstrate the telephone. Nearer and nearer came the judges, as the shadows lengthened into the late afternoon. The day was depressingly warm, and just before reaching the corner where the telephone was located, the judges declared they were tired out and would stop the examination for the day. Bell's heart sank and he grew ill with disappointment. But just at this juncture there was a stir in the educational section, Dom Pedro, Emperor of Brazil, accompanied by the Empress, was examining the exhibits. The judges fawned in the presence of royalty. Suddenly the Emperor espied the young inventor seated by the little table in the corner. There was a look of recognition and Dom Pedro hurried to Bell with a cordial greeting. Immediately the attitude of the judges changed. Who was this young man who claimed the friendship of kings? Bell explained his invention. Dom Pedro was interested and insisted on trying it. A spool of wire was unwound and one instrument was taken to a far room in the building. Bell talked and the Emperor heard. The judges talked and listened, while all were fascinated. They forgot the heat—forgot they were tired and hungry and it was not until after 7 o'clock in the evening that the Emperor went on his way and the judges ended their tests. The next morning's papers quoted the judges as saying the telephone was the greatest invention of the great exposition.

Three years before Dom Pedro had visited Bell's school for deaf mutes and had been much interested. Who can say how much the time of recognition of the telephone was advanced by the act of the young woman in insisting that Bell must go to the exposition, and by the happy circumstance of the Emperor's

propitious visit? Certainly it was a happy combination of events.

Notwithstanding that the possibility of transmitting the human voice was now an established fact, there followed another long period of struggle for commercial recognition. Even those who talked over the telephone and listened to the sounds of their friends' voices were skeptical. They suspected a trick. To the scientist and to the laborer alike the thing was incomprehensible. One mechanic insisted that the wire must be hollow. Editors ridiculed the idea of its having any usefulness. The banker said it might do very well for a grocery store but it would never do for a bank. On the other hand, the grocer agreed that it might work in a bank, but it would be useless in a store. Bell alone had sufficient imagination to picture the telephone in general use in the business world. But to all it gave a sort of gruesome feeling. The idea of talking against a disc of metal made them feel foolish, and the fact that the voice could be heard the distance of a city block brought the suspicion that in some way it must be allied with the powers of darkness.

But Bell was persistent. Others became interested. Problems one by one were solved. The switch-board was evolved. Two wires instead of one were found to remove induction. It was discovered that copper would give better transmission than iron, but it was too soft and could not be strung taut enough. Out of this grew the invention of hard-drawn copper wire, one of the most valuable contributions to the science of telephony. And there was born the long distance telephone line, which today is accepted in the most blase manner, as though it had appeared during the first six days and been pronounced good with the balance of creation.

So much for the early days of telephony. Not a decade has passed since its invention that has not witnessed a complete revolution in equipment and methods—not a year has passed that has not marked increased efficiency in the service. But the story is too long.

Today the telephone is so thoroughly woven into the warp and woof of commercial and social life that it would be difficult for the present generation to imagine an existence without this means of communication.

That the telephone is an important factor in business efficiency really admits of no argument. The broader statement may be made that the telephone has increased human efficiency in every channel through which human energy is directed. It has multiplied man's capacity for work and has extended his every faculty far beyond the circle which formerly circumscribed human effort. And this efficiency comes through binding people and communities together in a co-ordinated mass, making possible a co-operation such as was impossible before the advent of the telephone. Without means of instant communication, co-operation is impossible. Someone has said that those inventions which have bridged distances have done most for the human race. The telephone does even more than bridge distances—it absolutely annihilates space. It converts a state into a neighborhood, and a city becomes a household.

As an example of how closely the people of a state are united by telephone, let me recite an instance: At the time of the great San Francisco disaster, the governor of Massachusetts wished to secure the co-operation of the mayors of the different municipalities in the state in raising a relief fund for the sufferers. The Bell lines were placed at his command. In less than five hours the governor had gotten in touch with the more than 350 mayors and had them working along the lines which he suggested. Such instant co-operation between the people of a state would have been absolutely impossible before the advent of the telephone. Remember that the people of Kentucky waited three weeks before they heard that Madison was elected president.

The great slogan of the American people, and especially of the people of the West is "Do it now." The telephone enables us to live up to that motto.

Ian McLaren says, "No American goes slow if he has a chance of going fast. He doesn't stop to talk if he can talk walking, and he doesn't walk if he can ride." And the canny Scot might have added that in business affairs he neither walks nor rides—he telephones.

Today the man of important and varied interests accomplishes more in a day than his grandfather did in a fortnight. The reason for this is obvious. The grandfather depended upon a very incomplete telegraph system, the slow operation of the postal service, long railroad trips, and the then ubiquitous messenger boy. Today the telephone brings his business associates, his clients or patrons and prospective clients or patrons to the business man's elbow. If a question arises that requires the opinion of another, whether he be a block or a mile or two thousand miles distant, he turns to the telephone and the matter is settled at once.

Is there any question in the matter of bonds, coupons or financial matters of whatever character, the banker employs the telephone. And only forty years ago the banker scorned the idea of using the telephone on business conducted with so much secrecy. The telephone contributes largely to banking efficiency.

The grocer of today without a telephone could no more compete with others in his line than could an expressman driving oxen compete with the motor truck. No more order men going from door to door looking to customers' demands. The man at the telephone does the work of a half dozen men in carts or on bicycles. And yet it isn't so long ago that grocers said the telephone could never be of any use to them. It is safe to say that not a single business transaction is completed today without the use of the telephone entering into it in some way or other. It contributed infinitely to the efficiency of the engineers and superintendents in the building of the Panama Canal. Railroads have adopted it for the dispatching of their trains. At the larger terminals you will find a telephone in the observation car of every first-class train, which is connected up until the moment the train pulls out. The same thing is true in respect to steamships preparing to leave port. The large mines are all equipped with telephone lines connecting the superintendent's office, the shops, the ore houses and the underground work-

ings. From the lowest level of the mine the superintendent can discuss questions that arise with the mine president in a distant city. Likewise the bonanza farmer of the northwest employs the telephone to direct the work of plowing, planting and harvesting his thousands of acres. And by the same token it contributes to the success of the modest market gardener, for it enables him to keep in constant touch with the commission men—there is no more guesswork as to what his morning load should contain. He calls up and knows what is required.

The late E. H. Harriman was noted as a telephone user. It is said of him that on one occasion he raised a hundred million dollars in twenty minutes by using the telephone, and saved the Erie railroad. He had a telephone in every room of his palatial residence, including his private bathroom. Some one said to him, "You let the telephone make a slave of you." He replied, "No, I make a slave of the telephone."

When an accident occurs, the telephone becomes the first aid. In time of sickness the telephone keeps the doctor in touch with the case, and keeps anxious friends advised. It is the best guardian of the home. Night prowlers stand in awe of its powers. In case of fire or other disaster the telephone is the silent messenger that summons assistance. In the affairs of the heart it is a boon to lovers, and I must admit, in some such cases, it is also the despair of fond parents. It makes and breaks social engagements. It orders the groceries, does the shopping, conveys holiday greetings, and speaks words of comfort to bleeding hearts. It is found in every portion of the globe, from the frozen shores of Labrador to the South Sea Islands, and even in the darkest jungles of Africa. It speaks all languages from Bowery slang to Nipponese.

So intimately has the telephone insinuated itself into the very lives of the people, especially the lives of the American people, that any general cessation of the service or any general impairment of the service would be nothing less than a calamity.

In this connection, may I touch upon a matter that has to do with the public's share in the responsibility with the telephone company in giving adequate and efficient service? The public is interested in the quality of service and fairness of rates. The one question uppermost in the telephone user's mind is: Is the service as good as the company can give and are the rates as low as they ought to be? The average telephone user never asks the question: Are the rates which we pay sufficiently high to enable the company to maintain its plant at a high standard of efficiency, to pay salaries and wages high enough to attract men and women of superior ability, to maintain a proper reserve for deterioration and obsolescence, and in addition, to pay a fair return to the men and women who have invested their money in the business? And if one stops to think about it, the answer to the second question is the answer to the first. For it must be obvious that if the plant and equipment is not properly maintained the service must necessarily suffer; and if the employes are under paid the able and ambitious will seek other fields, leaving the service at the mercy of the less efficient; cheap labor never makes for excellence of a product; and

if no provision is made for a fund to take care of the depreciation the plant will some day fall into decay and there will be no means to rebuild it. And in addition to all of these, if there are not sufficient revenues to pay a fair return upon the investment capital will not be attracted, expansion will be impossible, no new plant can be built and eventually the service will be limited to certain circumscribed areas. This all gives a glimpse of a condition far from the ideal.

Whenever the people through their representatives arbitrarily force rates upon any public utility that are not adequate to meet the requirements which I have just outlined, the people themselves will eventually be forced to put up with a service far below the standard; such action renders the utility corporation helpless to give the highest class of service to which under fair rates the public would be entitled.

There was a time, and it was not so very long ago, that public utilities were promoted for the benefit of the promoter alone; generally the stock found its way into the hands of innocent purchasers, and the new owners found themselves confronted with the problem of paying dividends upon large issues of watered stock and generally with an inferior plant with which to make such dividends. That method is now very much out of fashion; and those utilities which were not inclined to voluntarily put their business upon an honest basis have been forced to do so by federal and state regulating bodies which have been created during the past few years. The public, however, has not been chastened to this extent. The fact should not be lost sight of that the public is just as susceptible of wrong notions and of wrong impulses as is any individual, but with no individual responsibility or conscience. It is undoubtedly true that the general public is gradually throwing off its prejudice and suspicion, growing out of misinformation or lack of information concerning large corporations. Corporations are more inclined to inform the public on all matters affecting relations between themselves and the public. Corporations are also more than ever before injecting the human element into the administration of their affairs. They are coming to the realization that merit is a surer and more reliable safeguard to their interests than is political influence. On the whole, the corporations and the people are getting closer together; the public is beginning to realize that there is such a thing as corporation character, and that a corporation can have ideals as well as can the individual. For instance, the corporation which I represent has ideals of construction standards; ideals of service efficiency; and ideals of duty to the public. In many ways we fall short of realizing the ideal, just as individuals fail to live up to the standards which they have set up for themselves.

SUMMARY OF WORK ON THE NATIONAL FORESTS.

During the past fiscal year there were constructed on the National Forests 227 miles of new road, 1975 miles of trails, 2124 miles of telephone line, 89 miles of fire lines, 81 lookout structures, 40 bridges, 222 miles of fence, 545 dwellings, barns and other structures, 17 corrals and 202 water improvements.

THE CONTRACTOR, DEALER, AND CENTRAL STATION

BY O. B. COLDWELL

(The relations that should exist between the electrical contractor and dealer, and the central stations, constitute problems that are of intense interest throughout the West where the merchandising of hydro-electric energy is each day being placed upon a higher plane of commercial development. Here is a splendid paper on this subject by the superintendent of the Portland Railway, Light and Power Company that, coming as it does from such a well-known authority, should command the attention of electrical contractors and dealers throughout the West. The paper was read before the recent convention of the Washington Association of Contractors and Dealers at Spokane.—The Editor.)

The title of this paper seems to intimate that certain definite specifications are to be laid down defining the exact policies to be pursued by the electrical contractor and central station as regards their relations and dealings with each other and the public.

Like most other statements of policy, however, a certain amount of variation and flexibility must be allowed to cover individual and local conditions. What may be an ideal arrangement in the relations between contractor and central station in one city may be found to be entirely inadequate in another, even though it may be of the same size and of approximately the same class as regards business conditions and the nature of the public to be served.

Probably the most predominant factor in the determination of policy as to relations between contractor, dealer and central station is the personnel of the group of men in any particular community who represent these branches of the industry. And this probably applies more particularly to the contractors and dealers than to the central station for the reason that the burden of proof, or rather of accomplishment, necessarily rests primarily with the contractor and dealer.

In other words, it is the local personal element in the business which we must largely consider in working out the details of our relations with each other, rather than such elements as the size of the community or the nature of the industries and homes to be served. This may be considered as fortunate as the personal element of the industry is, to a greater or less degree, within our own control and susceptible to remolding and improvement where found necessary, whereas, our influence over the size and nature of the community served can, at best, be only comparatively small.

As a general proposition, I think I can say that we are all, without question, agreed that co-operation and organized effort between contractor and central station is a thing greatly to be desired by both parties, and a condition which must exist before the industry can reach its fullest development.

Just how this may best be accomplished is, as above stated, largely a local problem in each case, and must be solved by the local management of the central station and of the contractors and dealers.

There is, however, at least one fundamental requirement which is common to any and all local conditions; that is, the real, positive desire on the part of the two elements to "get together" and know and understand each other and each other's problems. While this statement may seem to be rather trite and superfluous, the fact remains that there still exists in some communities a woeful lack of this real desire for co-operation, or at least an apathetic indifference toward its development.

Starting off, however, with the assumption that this desire for co-operation does exist, the next step is to crystallize this desire into organized action. I emphasize "organized" because little can be accomplished in the way of general co-operation without some kind of an organized plan for its accomplishment.

The three Pacific Coast states of Washington, Oregon and California have taken definite and commendable steps in this direction in the organization of their respective State Contractors' and Dealers' Associations and in the close affiliation which already exists between these associations and those corresponding organizations of the central stations in these states; namely, the Northwest Electric Light & Power Association, which includes Washington and Oregon, and the recently formed Pacific Coast Section of the N. E. L. A., which includes California.

As an expression of the attitude of the latter association toward the contractor and dealer, let me quote from the recommendations made by the commercial committee (and subsequently adopted by suitable resolution) at the recent Riverside convention:

"It is the sense of the committee that the member companies of the Pacific Coast Section get solidly behind the dealer and contractor movement, support the California State Association of Contractors and Dealers by helping it to create a fund for handling its work to better advantage, including the employment of a competent field man, and take advantage of the large volume of advertising, both national and local, already in the field, to the end that the central stations of this territory may get the benefit, to the fullest extent, of all elements that go to make up the industry."

"We believe that the member companies will benefit by fuller co-operation with the organization of contractors and dealers, with the thought in mind that in the contractors and dealers the central stations have active and energetic salesmen without the necessity of having these men on their pay rolls. We believe the time will come when the central stations can leave the merchandising subject entirely in the hands of the dealers with such supervision as must naturally be exercised by the central stations to get the best results for all interests."

Similar sentiments have been expressed from time to time by the older organization of the Northwest Electric Light & Power Association.

It, therefore, appears that the states of Washington, Oregon and California are fairly well advanced along the lines of the organization of dealers, contractors and central stations necessary for handling the machinery of real co-operation. In order to obtain the greatest benefit from these organizations, it is essential that periodical local meetings be held, preferably not more than a month apart, wherein both the

central stations' and the contractors' side of the various general and local merchandising and wiring problems can be heard and discussed. It is hardly necessary to point out that a thorough understanding of the other fellow's side of the question is one of the essentials of intelligent co-operation, and these local meetings, held regularly, are perhaps the best means of accomplishing this "get-together" spirit.

Let me quote from some comments made on this point by W. M. Hamilton of the Portland Railway, Light & Power Company:

"It is essential in any city or town where there are electrical contractors and dealers that they have some kind of an association with regular meetings not more than a month apart, and that an official representative of the central station be present at such meetings to exchange ideas with the contractors and to obtain their viewpoint as to the attitude towards their business that they would like to have the central station adopt in matters of detail as well as general policies."

"The regularity of these meetings is essential, although there may be but little business of consequence transacted at some of the meetings, for if they are allowed to become irregular, they will soon cease to be held, due to lack of interest, and the result will be that the contractors and central station will drift apart, to the detriment of the interests of both."

It should always be borne in mind that the central stations' primary aim is:

1st. To build up additional load or new business.

2d. To develop the use of additional energy by existing consumers.

3d. To hold the existing business, and in like manner the dealers' and contractors' primary object is:

1st. To develop and stimulate demand for electrical appliances and equipment.

2d. To maintain a reasonably profitable basis for their distribution and installation.

In other words, the central station's primary and fundamental object is to get and keep on its lines as many current consuming devices as possible, its profits being derived from the operation and use of these current consuming devices. On the other hand, the contractor and dealer is fundamentally concerned with the supply and installation of these current consuming devices, his direct interest in the matter terminating with the satisfactory installation of the equipment. His direct interests, therefore, end just where the direct interests of the central station begin, and the two interests are not fundamentally in competition or parallel with each other. Rather are they in series, and any effort expended in either section of the line to increase the current in that section, will as a natural result of such a connection, increase the current in the other section also, without detracting in any way from the benefits accruing to the first section.

While the two interests are not fundamentally in competition or parallel there has been, and still is in some cases, the unfortunate condition of a comparatively high resistance in the contractor's and dealer's section of the circuit, this resistance taking one or more of the various forms of indifferent merchandising; poor displays of appliances, lack of aggressiveness in wiring campaigns, poor workmanship, usually due to cut-throat competition, etc. To offset this comparatively high resistance, the central station has found

it necessary in such cases to go beyond the bounds of its logical section of the circuit and install shunts on the high resistance sections in the form of electric stores and in some cases wiring and supply departments.

Dealers and contractors naturally resent this intrusion on their field and it seems to be the present consensus of opinion among central station men as well as contractors that such intrusion is not justified where the contractors and dealers can clearly demonstrate their ability and willingness to properly handle this end of the game.

There has been and still remains to be done more or less pioneer work in the education of the public to the use of electrical appliances, but the competition imposed by the central station in taking the lead in this work is probably more than offset by the indirect benefits accruing to the dealers later in the form of stimulated demand for wiring and additional appliances.

In this development work, however, the central stations should, and for the most part have protected, the dealer by selling appliances at standard list price or at a price which the dealer can meet with a fair margin of profit. One possible exception to this is the electric range, which is a distinct problem in itself and of which more will be said later.

It has been suggested that the central stations confine their merchandising to those devices with an inherently high energy consumption such as the iron, toaster, percolator, heater, etc., leaving the other appliances such as washing machines, sewing machine motors, fans, cigar lighters, and other similar low consumption devices carrying a good merchandise profit to the dealer.

Others recommend that the central station confine its merchandising activities solely to current consuming devices, leaving all supplies such as wire, lamp cord, sockets, fuses, etc., to the dealers.

A modification of both of these plans will probably be found to be most expedient at the present stage of the industry.

In this connection, it is of significance that the progressive gas companies are still actively engaged in the merchandising of gas consuming devices, indicating that in their opinion the dealers have not yet fully qualified to take care of this end of the business.

Mr. S. V. Walton of San Francisco calls our attention to another phase of the electrical merchandising game which should not be overlooked, and which has more or less bearing on the subject of this paper. It is the prominent part now being taken in the sale of electrical appliances by drug stores, furniture stores, novelty stores, hardware stores and department stores. It has recently been discovered in San Francisco that the bulk of the electrical merchandising is being done by such stores, only a comparatively small proportion being handled by the strictly electrical dealer. This, of course, cannot be taken altogether as a reflection on the electrical dealer, as the large department and household goods stores have undoubtedly certain merchandising advantages not to be paralleled by the specialist in any particular line. It does behoove the electrical dealer, however to inject into his business

(Continued on page 308)

OBSOLESCENCE AS AN ELEMENT AFFECTING RATES

BY C. E. GRUNSKY

(Obsolescence is an element that affects the fixing of rates to be charged by public utilities and as a consequence it is a live topic in the West where the subject is now before rate-fixing bodies in several commonwealths of this section. Here is a discussion on this subject that was brought out by the author in the San Francisco Gas and Electric Company's rate-case, now on trial before the Master in Chancery. The author's comments on obsolescence are in the main here reproduced. Due to the widespread interest in this timely subject this contribution should receive wide attention.—The Editor.)

An appliance, machinery or a process of manufacture in use by a public utility may under efficient management at any time be superseded by a better device or process. When this is the case more or less property is usually discarded, which, under the conditions as they prevailed when this property first came into use, should have served for many years longer. Obsolescence has forced its abandonment.

The knowledge that obsolescence may shorten the term of usefulness of a machine or of portions of any plant used in the public service has prompted valuation experts and the rate regulating authorities to attempt estimates of the allowances which should be made in the earnings to cover the prospective abandonment of property due to this cause.

The last word has not been said in the discovery of new forces in nature and their adaptation to human requirements. It is the belief of many engineers, for example, that the internal combustion engine will put the old types of marine engines of ocean freighters on the scrap heap, and yet the older type under gradual development to its present high state of efficiency has maintained itself for more than a hundred years.

The use of oil in place of coal, not alone as a producer of gas but also as fuel in the production of steam, has caused appliances and machinery to be abandoned which would otherwise have continued in service. No one today can be sure which of two extremes is most likely to prove true, whether, for example, the last word has been said in the manufacture of gas and there will be no further abandonment of standard gas making appliances and processes, or whether, due to exhaustion of sources of oil, or due to other causes, there may not be some new substitute for oil or for the gas itself found which will render some of the most modern appliances of the day obsolete in the near future.

Past experiences in the matter of abandonment of property, due to obsolescence, is not a dependable guide to what may happen in the future. In this respect there is a difference between the failures from this cause and those which result from the wear and tear of use and from the somewhat less regular failures through accidents incident to human frailty, fire and similar causes. In the one case the basis for a satisfactory prediction is lacking. In the other the probability of events occurring in the future can be predicated with some confidence upon what has occurred in the past. There is a difference, too, between replacements made as the result of obsolescence and replacements due to failure from other causes. In the case of obsolescence the replacement is made with some device which betters the service—the output costs less, or the service is made more reliable or the quality of the output is improved, while in the case of ordinary replacements or renewals the betterment of service is not a necessary incident.

It is proper to charge the rate-payer with the cost of replacement when property fails from ordinary causes and to let the earnings, therefore, cover a replacement increment during the useful life of any item of property and to base the charge on the ordinary replacement requirement as determined for such property. Not so, however, in the case of obsolescence. This will be made plain by the following considerations.

There would be no obsolescence if the improved machinery or the new process which takes the place of that which is being replaced did not result in some advantage to some one. If the obsolete property were treated as though its failure had been correctly foreseen and as though funds for its replacement had already been collected from the rate-payers and if the owner had not in fact collected sufficient funds, and if thereupon the remaining value of the obsolete property or the capital investment at which it was carried in the rate-base were immediately ignored, and rates were established as though the abandoned property had never been in use, the rate-payer would at once get the full benefit of the innovation and the owner would have made a sacrifice of capital which he could perhaps have avoided by being a less efficient manager and holding to the older, less efficient plan of operation. Let it be known that the usual procedure will be to forecast failures by obsolescence and to amortize the capital in such properties on the basis of assumed average conditions which means inadequate amortization in many cases, and there will no longer be any inducement to the owner to improve the efficiency of his plant. He will conclude that it will be safest not to use new inventions or to introduce new processes so long as a sacrifice of capital is thereby involved. He might, in making an innovation, find that he had on his hands abandoned property, the cost of which has not only not been fully returned to him but concerning the further amortization of which the established rules of rate regulating bodies may give no adequate assurance.

It seems self-evident that when the introduction of a new invention, whether the same applies to a machine or to a process, reduces the cost of operation, the resulting advantage should go to both the owner of the utility and the rate-payer. But it is also true that in such event, there will be no hardship imposed on the rate-payer if the benefit of reduced cost of producing the output, does not come to him immediately. A reasonable procedure would therefore be, in all such cases, to allow the rates to remain as they would have been without the new process, unless a reduction would result in increased demand and greater net profit to the owner, at least long enough to amortize so much of the original plant as is thereby rendered useless and, thereafter, to so adjust rates that, for a suitable period of time, the benefit of the reduced cost will be shared on a fair basis by the owner and the rate-payer. Any treatment less favorable

to the owner of a public utility would discourage the introduction of innovations if they involve further investment of capital and would make for inefficient rather than for efficient management. The owner must not be expected to consent to an increase of hazard without an increase of profit.

The practice of attempting to foresee obsolescence and of burdening the rate-payer before the failure by obsolescence with the charge that is necessary to amortize the capital which obsolescence renders useless, is not alone unwise but unjust. It is not fair to the rate-payer because those who pay rates before the betterment is made should not be made to pay for the advantage which will come to those who pay rates after the betterment has been made; it is not fair to the owner because while apparently increasing his earnings it will act, as do all high charges for service, as a deterrent upon the extension of business and because there will be cases where by error in the estimate of time allowance for obsolescence the owner will be called upon to make a sacrifice when due to obsolescence property is abandoned, which can not be offset against the advantage that may come to the owners of other utilities who benefit by an allowance for something which, in their case, never happens. The obsolescence will, in many cases, occur before any adequate provision has, in fact, been made.

To illustrate the problem which is presented when one type of machinery is replaced by a better type, let it be assumed that the machinery of an old style generating station has been replaced by steam turbo generators, that the old machinery had been in use for some years, that it was still in first class condition but that its abandonment was advisable because, all factors being taken into account, the generation of electric energy will be cheaper with the new installation.

Suppose that the remaining or present value of the abandoned machinery, as a part of the utility, was \$200,000 (original cost \$250,000 less \$50,000 earned replacement), and that \$75,000 was realized from its sale after abandonment. Suppose further that an appraisal of the new machinery after its installation shows that it should be introduced into the rate-base at \$150,000.

Two cases are possible, either the \$50,000 of earned replacement increments have actually been returned to the owner and have reduced the remaining investment from the original \$250,000 to \$200,000, or the \$50,000 are carried in a replacement fund. In the first case on the assumption that only property in use is carried in the rate-base, there would be, after the new machinery is installed, a value to be taken into account reduced by the \$200,000 and increased by the cost of the new machinery, that is, \$150,000 less the sale value of the old, or $\$150,000 - \$75,000 = \$75,000$. The result would be a net reduction of present value, as appearing in the rate-base, of \$125,000. This amount, on some theory other than "present value," could be retained in the rate-base subject to amortization, or it could be transferred to profit and loss or some other account where it would be carried until together with interest thereon it is completely wiped out. In the second case the old machinery would have been carried in the rate-base, at the time of its obsolescence, at \$250,000, the original cost, undiminished by accrued depreciation, but this amount would have been offset in part by the \$50,000 in the replace-

ment fund. By the transfer of this sum the \$250,000 would be reduced to \$200,000 and there would then be an addition of the net cost of the new machinery, or \$75,000. The rate-base would include on account of both old and new machinery an amount of \$275,000, which is \$125,000 in excess of what should be in it if original investment in property in use is the determining factor. In either event there will be \$125,000 to be either carried indefinitely in the rate-base or to be amortized within a reasonable time.

Unless the owner felt reasonably certain that the \$125,000 would be returned to him in some way, he would not prematurely discard the old machinery. If as a result of the change rates are reduced to a point excluding interest on and amortization of the \$125,000 the owner will have made a sacrifice for the benefit of the rate-payer out of all reason. If, however, the rates remain undisturbed for a time, then, during this time the excess of earnings, over operating expenses, will be larger than it had been under the original plan of operation by the amount that the cost of operation has been cut down. This increase of net earnings, perhaps cut down somewhat by voluntary action of the owner, should be used to amortize the \$125,000 and interest thereon, and when this is accomplished a reduction in rates would naturally ensue, and the rate-payer would share in the benefit resulting from the reduced cost of operation.

(Continued from page 306)

as many of the modern merchandising methods of these other firms as he can afford, if he hopes to hold even a share of this business. The modern electric appliance is little, if any, different from any other forms of merchandise and must be handled accordingly.

The electric range, in its present state of development, may be considered as a distinct problem in itself.

Electric cooking is now going through the period of demonstration and educational development. We had similar problems only a few years ago in the introduction of electric power applications and only a few years prior to that the introduction of electric lighting. The central stations necessarily bore most of the burden of the pioneer work.

At present costs of manufacture, it offers little, if any, chance for a merchandising profit, and for this reason there should be little or no objection on the part of dealers to allowing the central stations a more or less free hand in its introduction.

Most of the central stations are at the present time satisfied if they can get the range on their lines at bare cost (not including the cost of furnishing service). Even on this basis, the initial cost to the consumer is an obstacle not easily surmounted, and to add a sufficient profit to make the range game attractive to the dealer, would in most cases be suicidal to the chances of getting the range connected.

It would seem, therefore, for the present at least, that the central stations must necessarily carry the bulk of the range business. There is no reason, however, why satisfactory arrangements cannot be made between dealers and the local central station providing for a commission to the dealer from the central station on all ranges sold and installed by him in competition with the cost price offered by the central station.

RECENT ADVANCES IN WESTERN WATER LAW

(Water right adjudication has long been a perplexing question in the West and in many instances the court proceedings have proven so intricate and unsatisfactory as to discourage investment in irrigation and water power development. Here is an important advance in California in the method of adjudicating water rights that, it is believed will vastly simplify procedure and at the same time forward the stability and general confidence of the public. Engineers and others interested in water rights throughout the West will find this article descriptive of the new procedure by the California Water Commission of much timely interest.—The Editor.)

NEW ADVANCES IN WATER RIGHT ADJUDICATION

BY A. E. CHANDLER

Marking a new epoch in legislation pertaining to water rights in California, the State Water Commission is about to undertake its first adjudication since organization in March, 1915. The Stanislaus River watershed has been chosen, on the joint petition of the South San Joaquin and the Oakdale irrigation districts, for the initial work. These two districts comprise 141,000 acres, situated in San Joaquin and Stanislaus counties. The systems are perhaps the most modern in irrigation construction and their combined cost aggregates over \$5,000,000. The announcement is perhaps the most important made by the water commission and one of the most important ever made by any public body in the state. It is of state-wide significance as being the commencement of active work in the policy of the new water legislation, which will finally extend to every stream in California. The adjudication procedure is one of the features of the Water Commission Act. That no action was taken on it before, was due principally to the incompleteness of that phase of the law as it was originally enacted. The correction of this at the solicitation of the water commission, was one of the principal acts of the last legislature. It is doubtful if any other official act of recent years has been more far-reaching in its effect both as to the number of people involved and the extent and value of property interests, than this decision of the water commission to proceed with the adjudication of water rights on the streams of the state.

The Stanislaus stream system is important as to irrigation, mining and power. The river is 120 miles in length, from the source of the Middle Fork in Alpine County to its junction with the San Joaquin. Forty miles of this is in the valley. Above the valley, the watershed of the river embraces 950 square miles. Its discharge at Knights Ferry, above Oakdale, Stanislaus County, where the stream emerges from the foothills, is shown by records of the U. S. Geological Survey to average annually enough water to more than cover a million and a half acres a foot deep. The counties of Alpine, Calaveras, Tuolumne, Stanislaus and San Joaquin are embraced in its watershed.

There are two classes of water rights recognized by law on California streams—riparian rights and rights by appropriation. Riparian rights are those which pertain to lands bordering on the banks of a stream, while rights by appropriation are those which pertain to lands which are not directly in contact with the stream, but which by proper procedure have ac-

quired rights to the use of the waters. The newer legislation in water rights favors the doctrine of appropriation as opposed to the riparian doctrine, known as the English common law doctrine. The Water Commission Act makes no provision for adjudicating riparian rights, hence all adjudications must be for rights by appropriation only. The charges for the adjudication are based on a graduated acreage fee. The procedure which has not been publicly expounded before, is therefore of general interest and is summarized as follows:

When the water commission enters upon an adjudication, by any of the three means by which such procedure may be initiated, its engineers and other representatives proceed to a complete examination of the entire stream system, which includes the main stream and all its tributaries, as to flow, conduits diverting water, rights to the waters, use, acreage and all other phases involved. Each claimant to water is required to furnish proof of his appropriation in detail, for the establishment of his claim. When these proofs are all in, a transcript of them is made and printed and a copy sent to each claimant so that he may be informed of the claims of every other claimant. All the original documents thus submitted, together with all maps, surveys and data gathered by the commission are then, after due notice, thrown open to public inspection at convenient places designated by the commission. Following inspection, contests may be entered by any against the proofs of appropriation. Such contests are heard by the commission. Following this procedure, it is the duty of the commission to decide upon the relative rights of all the claimants to the use of water of the stream system. This decision is known as a "determination." The determination is immediately filed with the Superior Court, which makes an order fixing a time for hearing same, at which time any claimant dissatisfied may take exception.

In case no exception is filed, the court must enter a decree confirming the determination of the commission. Should exception be taken, the court proceeds to a hearing of the case, as in civil matters, at which further evidence and data may be received. Finally the court enters a decree either confirming or modifying the decision of the water commission. This final decree is termed the "adjudication," and is conclusive as against all but an appeal to the Supreme Court. It specifies and settles the rights of each claimant as to his priority, amount, purpose of use, place of use, point of diversion and if for irrigation, the specific land to which the water is appurtenant, together with such other conditions as may be necessary to define the right. The water rights are recorded and the water commission

issues each claimant a certificate as evidence of his right as adjudicated.

The proposed adjudication will settle many long standing disputes, which have made water rights in California so uncertain and insecure and will do much to clearing off a complex condition in all sections of the state. The work on the first adjudication is to be commenced immediately.

ELECTRO-CULTURE

(Interesting data have been compiled on the increasing of crop production by electro-culture. The fertility of soils in the West has always been so favorable for giant yields that little attention has been paid toward forcing additional production. Electro-culture should, nevertheless, receive wide appreciation in the West, where abundant power is available. The data published herein is presented to our readers through the courtesy of the Electrical Review of London and the Electrical News of Toronto.—The Editor.)

The method of distributing the charge to the crops as carried out at various experimental points in Great Britain has been much the same. A network of wire, or strands, barbed or plain, were stretched over the crops at a convenient height from the ground by means of high tension insulators and kept charged to a potential of about 80,00 to 100,000 volts. As network is generally inconvenient and expensive and barbed wire involves the use of heavy poles and large insulators, the choice usually falls on the plain wire. The density of an electric charge at any point on its body is proportional to the curvature at that point. That is, the potential would be greater as the curve is greater, and, therefore, the wires should have as small a diameter as possible. Wires of from 20 to 30 s.w.g. maintained at 90,000 volts appear to give the best results. This is just about the pressure at which corona appears and so, at this potential, it is possible to transmit, if necessary, without much energy loss so that all leads to the network may be of bare wire No. 10 or 12 s.w.g.

A network of fine wires may be used in a span of 150 ft. with a sag of not more than 8 to 12 inches if silicium bronze or galvanized steel is used. It is better to keep the wires as low as possible, thereby intensifying the discharge. However, to avoid concentration on some plants which are higher than others, the distance between the wire and the ground should be at least equal to twice the height of the tallest full grown plant. It is also necessary to allow sufficient space for working under the wires, so that it would appear that a distance of 7 ft. from the ground is about the minimum.

Three methods are in use for producing the high tension current with which the network of wires is charged: (1) static machines; (2) step-up transformers; and (3) induction coils. Of these, the coil seems to be open to the fewest objections. Wireless and X-ray work have produced so great a demand for these machines that they have now become thoroughly reliable and are available at a moderate cost.

According to the Electrical Review, the discharge appears to act, roughly speaking, as artificial sunlight, and, as it is quite possible to over-stimulate plants, judgment is necessary in determining how long to keep the discharge going each day. In damp, cloudy weather

four or five hours per day would appear to be about right; a sunny day would require less, while in hot scorching sunlight, or in periods of very dry weather the discharge should be discontinued altogether. It will thus be seen that this method of culture appears to supply a means of counteracting lack of sunlight—a condition experienced, for example, at many points in Canada during the months of May and June of the last two years. Another useful effect of the electric discharge is that blight and insects appear to be destroyed. It is said that these are quickly cleaned from such things as beans and carnations, and so on, when attacked.

Morning and evening are the best times of application, particularly the morning, and, as the crops under this treatment draw more from the soil, both in moisture and food, it is necessary to supply more water and fertilizer.

A TYPICAL INSTANCE OF UNDERGROUND WATER SUPPLY

In recent years the electrically operated pump has found wide application throughout the West in pumping water for irrigation from underground sources. A typical study of underground water supply has recently been completed by the U. S. Geological Survey.

Luna County, in southern New Mexico, is not rich in metallic minerals, but parts of the county are underlain at no great depth by waters which are of great value for irrigation. These waters are now used extensively, and when they are fully utilized their products will be of great value. In the Deming folio of the Geologic Atlas of the United States, now being issued by the United States Geological Survey, Department of the Interior, Geologist N. H. Darton gives a description of the greater part of Luna County. He shows that although the area underlain by water is wide and long, it has its limits and homesteaders taking land outside of the favored district will be disappointed in their water supply. In this publication many facts are given as to depth of wells, volume of water available, and other important details as to water resources. The water-bearing beds are 20 to 50 ft. thick and consist of gravels and sands deposited by Mimbres River, mostly lying from 20 to 200 ft. below the surface. They underlie about 500 square miles of country, and it is estimated that in this area there is sufficient water to cover 2,500,000 acres to a depth of 1 ft. This supply will bear considerable draft, but as the source of the water is not unlimited crowding of pumping plants would in time seriously deplete the supply. There are in the area about 300 wells now being pumped, and the many acres under irrigation are yielding good crops of forage and vegetables. Accordingly the region is prospering, and Deming has developed into a town of considerable importance.

It is estimated that there are four million and a quarter automobiles in the world, of which number three million and a half are located in the United States. What a saving in fuel will be accomplished when these all become electrically operated!

SUGGESTIONS FOR CONTRACTOR AND DEALER

DEPARTMENT CONDUCTED BY GEORGE A. SCHNEIDER

(The question of repair parts and how to properly handle orders for them often proves a perplexing problem in the every day life of the electrical contractor and dealer. This question and other discussions of equal interest and importance are treated in this issue in the following lines. This department is conducted by the power apparatus specialist of a well-known electrical supply house in San Francisco and the matter herein treated is taken from questions that daily arise in the progress of the art. Contractors and dealers having problems to solve that are proving troublesome in solution are urged to send them in to the editor and they will be answered in this department.—The Editor.)

HANDLING REPAIR PART ORDERS

There is probably no other class of orders which the electrical dealer or contractor is called upon to handle that give so many chances for dissatisfaction on the part of their customers as those covering replacing parts required in connection with repair jobs. Repair parts are seldom ordered until needed and then are generally wanted in a great hurry. In these times when deliveries are poor there is ample opportunity for delay and misunderstanding if such orders are not carefully handled.

An analysis of any considerable number of repair part orders will show that in a large percentage of the cases the principal cause of delay and trouble is the fact that complete information covering the parts needed and the device or machine for which the parts are required is not given or at least is not accurately given.

A similar study of the reasons why complete information is not always given brings forth some interesting facts that ought to interest all who are called upon in any way to handle these orders. Among them we find that very often it is difficult to give a description of the part wanted or in some cases the wrong descriptive term is applied. Again the name plates identifying the device or apparatus have been removed or changed and in ordering parts some dealers endeavor to use the data applying to a machine which they think is identical but which later proves to have been different in minor details. Many mistakes also result from errors in copying the serial numbers. Very often these numbers and other necessary information are not given because the device is some distance from the dealer and he tries to order by simply giving a brief description of the apparatus. Such instances are almost daily occurrences in connection with orders for motor repair parts. Further, many manufacturers do not issue repair part catalogs or do not sufficiently identify their apparatus to permit extra parts being ordered intelligently.

Decided improvement along these lines, however, is now noticeable and many manufacturers are taking the necessary steps to issue repair part catalogs or to otherwise incorporate the information needed to order parts for apparatus of their manufacture in their instruction books or other descriptive literature. To further assist along these lines one manufacturer has adopted the practice of either giving the catalog number of the parts most frequently ordered or in specifying the number of the part catalog or bulletin in which the parts for the device are illustrated and listed. This is done by means of a small brass name plate, in addition to the regular rating plate, attached to the device.

Many other manufacturers seem to be adopting equivalent means of better identifying their goods and the principal repair parts needed. All of these precautions are indeed helpful and if used as intended will save a great deal of delay and money and many misunderstandings as well.

This question in general is a broad one and it would not be at all difficult to write a lengthy article on the subject. The space available does not permit of this but the writer believes the following condensed suggestions if followed will materially assist in decreasing the delays, troubles and unnecessary expense incident to the handling of such orders.

(a) Specify clearly the names of the parts wanted and the device or machine for which the parts are intended. If the machine carries one or more plates give all of the data from each plate, also any numbers that can be found on the parts needed.

(b) Specify the number of parts required. Don't simply say "one set" or the like.

(c) Always state if the parts are urgently needed and if the parts are to be ordered by telegraph. At the same time remember that often the profit on the transaction will be less than the cost of the telegram. Manufacturers should not be expected to stand the cost of such telegrams. Inform your customer of these facts.

(d) Always give shipping instructions and state whether parts shall be forwarded by express, parcel post or freight. Specify carefully whether or not the carrier charges are to be prepaid or not. Always estimate the weight of the shipment and the charges involved before instructing how shipment shall come forward.

(e) Don't make promises of delivery on parts unless you have definite information from the manufacturer or supplier.

(f) Don't quote prices for parts unless you have a quotation or similar information from the supplier upon which you can base your estimate. Remember repair parts as well as the finished product have advanced considerably during the past two years. In fact, on account of factory conditions some manufacturers will not supply parts for very old apparatus under any condition.

(g) Don't order parts by giving information from some other device of the same manufacturer that seems to be identical with the device for which the parts are actually wanted. There may be minor changes that will prevent the parts being used interchangeably.

(h) By all means do not promise your customer that you will get the parts from the manufacturer without charge unless you are fully conversant with the guarantee covering such apparatus, the time it has been in use and other similar facts. It pays to withhold all comment regarding such questions until you are sure of your ground.

NOTES ON CURRENT AND POTENTIAL TRANSFORMERS

Current and potential transformers, or instrument transformers as they are commonly named, are required in connection with most installations of alternating current switchboard instruments and in some cases with portable instruments. They are also used extensively with other devices such as voltage regulators, relays, oil circuit breakers, and starting and protective devices.

There are several reasons why instrument transformers are so extensively used. The most important are:

(a) It is not always practical to construct electrical instruments or similar apparatus of sufficient capacity to be connected directly with circuits in which either the voltage or current exceeds a certain limit.

(b) For the general safety of the operators it is necessary to keep high tension circuits away from switchboards or similar control apparatus which is frequently handled.

(c) It is sometimes cheaper to use instrument transformers than to design apparatus suitable for connecting directly with the circuits.

(d) By adding the necessary current or potential transformers instruments already in service may occasionally be adapted to other circuits where otherwise they would not be satisfactory.

The design and manufacture of these types of transformers must be carried to a far greater degree of refinement than is necessary in the ordinary lighting or power types because the accuracy of any instrument or group of instruments connected to a transformer is affected by the operating characteristics of the transformers.

One manufacturing concern has taken advantage of these possibilities and now offers two distinct lines of current and potential transformers. One line includes the standard current and potential transformers suitable for any class of service. The other line consists of a limited number of types for use only with those devices that do not require a transformer of the highest accuracy.

To distinguish between the two types of potential transformers the less accurate and lower price types are known as voltage transformers. They are made for use on circuits of 2500 volts or less and are used extensively in connection with the low-voltage coils of protective and controlling devices such as oil circuit breakers or starting compensators. Corresponding current transformers are made in sizes up to about 800 amperes and for circuits of 2500 volts or less. They are designed especially for use with automatic circuit breakers either separately or in connection with suitable relays. They can also be used with ammeters when the highest accuracy is not essential but should not be used with other types of instruments.

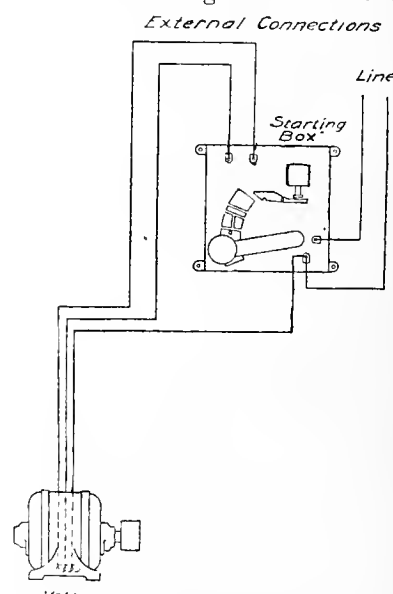
The substitution of these special types of transformers may often effect a considerable saving.

REPLACING 6-LEAD SINGLE-PHASE STARTERS

It is not generally understood among many who are engaged in handling motors in one way or another that the CR-1027 resistance-reactance starters now in the market for use with a certain line of single-phase

induction motors can be used in most cases with the early type 6-lead single-phase motors which were sold quite extensively some years ago.

In general appearance these motors were similar to the line of small polyphase motors built by the same manufacturer, in fact the same general lines of frames were used. The stator windings were practically the same as those of a standard three-phase motor but both leads of each phase were brought out, making a total of six. The starters for these motors consisted of a triple pole double throw knife switch with several extra contacts and a resistance and reactance coil for producing the necessary phase displacement in the windings during the starting period. Six leads were brought out from the starters to correspond with the six motor leads. A spring was provided to prevent the switch lever from being left in the starting position. The connections were such that during the starting period the windings were Y connected, with



Connections of 3-lead Single-Phase Induction Motor with CR-1027 Starter

the resistance and reactance coils connected across the line and in parallel with the motor windings. In the running position the motor windings were connected in delta and the resistance-reactance coils were disconnected from the motor windings.

The connections of the CR-1027 starter used with the later type 3-lead resistance-reactance starting single-phase motors are shown in the accompanying figure. When using this type of starter with the old 6-lead motors it is only necessary to connect leads 1 and 2, 3 and 4, and 5 and 6 together, then consider them as three leads only and connect as shown in this diagram. With these new type starters the motor would start and run delta connected and the resistance and reactance coils would be in series with the motor during the starting period. These starters have low-voltage release which is an improvement over the old 6-lead starters which were not so equipped.

When using the later type starters, the starting torque of the motor may be slightly changed and in some cases these starters may not be found satisfactory. Generally speaking, however, they will give the same results. It will depend upon the size of motor and the torque required by the load to be handled.

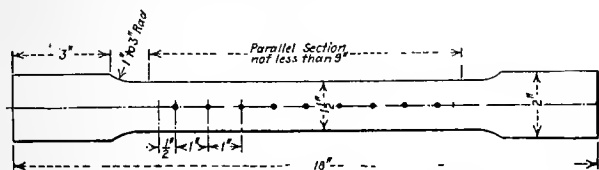
FUEL OIL AND STEAM ENGINEERING

(The increasing number of enactments by state legislative bodies and accident commissions make a study of the underlying principles of boiler inspection in fuel oil practice a matter of great importance. In the last discussion the authors set forth the standard books or authorities on this subject, briefly explaining the value of each, herein is given a short discussion of the fundamental tests involved in boiler inspection and finally is set forth a detailed method whereby the strength of rivets and the safe working pressure of the boiler may be ascertained.—The Editor.)

HOW TO COMPUTE STRENGTH OF BOILER SHELLS IN FUEL OIL PRACTICE

BY ROBERT SIBLEY AND CHAS. H. DELANY

In order to ascertain by computation the maximum allowable pressure we must first compute the bursting strength of the solid boiler shell, then find the weakest part of this shell, which, of course, will give us



STANDARD FORM OF TEST SPECIMEN

In order to thoroughly test out plate material for boilers, a form of standard specimen has been established by the Boiler Code Committee of the American Society of Mechanical Engineers. The above illustration shows the standard form for the tension, cold-bend, and quench-bend test to be made from each boiler plate as rolled.

the point where the shell would really give way. We next compute the steam gage pressure that would cause the boiler to rupture at this weakest point. This is known as the bursting pressure. It is important to note here the difference between the bursting pressure of the boiler and the bursting strength of the boiler shell. The former indicates the reading of the steam gage at which the bursting will take place while the latter indicates the unit internal pressure in the boiler material when rupture occurs.

As a working gage pressure for boiler operation a factor of safety of 5 is often used—that is, a gage pressure $1/5$ that of the bursting pressure is considered as the largest gage pressure that may be safely put upon the boiler. It should be noted that when considering the safety of a boiler we always deal with gage pressure and not absolute pressure. The bursting pressure of a boiler is the difference between the pressure inside the boiler and the pressure outside, when rupture would occur, and as the latter is always the pressure of the atmosphere the bursting pressure must be the amount the inside pressure would be above the atmospheric pressure, which is the same thing as gage pressure.

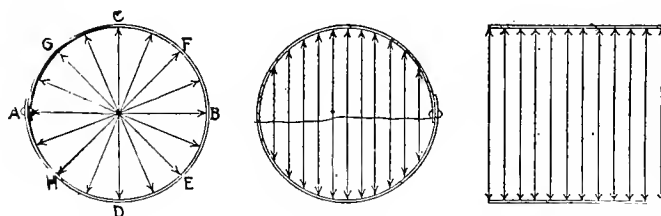
In order to ascertain the breaking strength of boiler material, a sample known as a standard form is put to test. Experimentally it has been found that whether a piece of material is subjected to rupture by tension, compression, or shear, the unit force required to rupture a square inch section, is equal to the total force observed in rupturing the specimen in each particular case divided by the cross-sectional area. This fundamental law enters largely in computation of boiler strength. Let us then proceed to this analysis.

The Strength of the Solid Plate.—In the study of gases and vapors it has been experimentally estab-

lished that the pressures exerted by such substances are felt equally in all directions at any given point under consideration. Let us then consider the most disastrous direction for pressure action. This evidently would be in such a direction as would tend to tear the boiler shell apart. If the length of shell considered be of length p equal to the distance from center to center of the riveted section or what is known as the pitch of the rivets, we have for a boiler of thickness t a resisting area of pt square inches. If the solid shell will not burst until each square inch of area has upon it a unit force of S_t pounds, the total resistive force according to the experimental law stated in the previous paragraph is evidently $pt S_t$. Hence if A is the strength of solid plate, we have

$$A = tpS_t \dots \dots \dots (1)$$

Rule I. Multiply the thickness of the plate by the pitch of the rivets and by the tensile strength of the plate. The result is equal to the strength of solid plate.



A DIAGRAMATIC REPRESENTATION OF INTERNAL BOILER PRESSURE

Since the pressure of a vapor is exerted equally in all directions we should consider that direction which would produce the most active results in tearing apart a boiler when deducing expressions for the safe working pressure. In order to ascertain the total pressure tending to burst the riveted section shown in the middle figure above, the pressure should be taken with the direction as shown by the arrows in this figure.

As an illustration, let us compute the strength of the solid plate for a boiler whose thickness of shell is $1/4$ in., whose spacing of rivets is $1\frac{3}{8}$ in., and whose tensile strength stamped upon the boiler plate is found to read 55,000 lb. per sq. in.

Applying Rule I, we have that the strength of solid plate is

$$A = tpS_t = 0.25 \times 1.625 \times 55,000 = 22,343 \text{ lb.}$$

The Strength of the Net Section.—As in the case of the weakest link determining the strength of the chain, so the strength of the boiler shell is determined by its weakest section. This will evidently be at the point where the shell has been perforated for the insertion of rivets. The actual area that will resist rupture is now no longer pt but since it has been weakened by an area dt wherein d represents the diameter of the rivet hole, B , the net resistive force now becomes

$$B = (pt - dt) S_t = (p - d) t S_t \dots \dots \dots (2)$$

Rule II (a). From the pitch of the rivet subtract the diameter of the rivet hole, then multiply by the thickness of the plate and again by the tensile strength of the plate. This result is equal to the strength of the plate between rivet holes—in other words to the strength of the net section.

Taking as an illustration the same boiler mentioned in Rule I, we have, if the diameter of the rivet hole is 11/16 in., that the strength of the plate B between rivet holes is

$$B = (p - d) t S_t = (1.625 - 0.6875) 0.25 \times 55,000 = 12,890 \text{ lb.}$$

Resistance to Shear.—A boiler may not only fail by bursting apart the actual shell material but the rivet itself may give way. Under pressure the riveted boiler seam may pull apart and cut or shear off the rivet similar to the action that would take place by using a huge pair of shears. The area of cross-section of the rivet is evidently the only opposition that such an action would receive over the distance between one set of rivets in case of a single row of rivets, or if there be n rows of rivets, the area resisting shear is n times that for a single row. Hence, the force that would oppose rupture due to shear is evidently $n (.7854d^2) S_s$, where S_s is the pounds pressure exerted over each square inch of cross-section under shear. From results shown by tests, average iron rivets will shear at 38,000 lb. per sq. in. in single shear and 76,000 lbs. in double shear; steel rivets at 44,000 lbs. in single shear and 88,000 lbs. in double shear. Hence we have that the resistance to shear C for a riveted section is

$$C = .7854d^2 n S_s \dots\dots\dots (3)$$

Rule II (b). Multiply the area of the rivet (.7854d²) by the shearing resistance as follows. If iron rivets in single shear, allow 38,000 pounds per sq. in. of section, or if of steel allow 44,000 pounds per sq. in. If the resistance is in double shear add 100 per cent to the above. The result is the bursting pressure for shear.

Continuing the example above cited, we have that the shearing strength C of one rivet in single shear is

$$C = n \times .7854d^2 S_s = 1 \times .7854 \times .6875^2 \times 44,000 = 16,332 \text{ lb.}$$

Resistance to Compression.—Again the rivet may be forced to give way by having its longitudinal section (dt) actually crushed if the total crushing force of the steam pressure exceed dtS_c , where S_c is the crushing pressure in lb. per sq. in. over each unit area of the rivet. Hence the resistance to compression D is

$$D = dtS_c \dots\dots\dots (4)$$

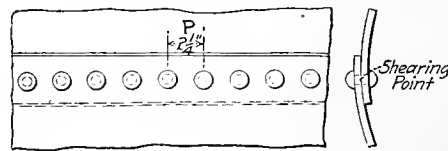
Rule II (c). Multiply the diameter of the rivet by the thickness of the boiler plate and then multiply by the unit bursting stress for compression for the rivet which is taken at 95,000 lb. per sq. in. The result is equal to the strength of the rivet section for compression.

The resistance to compression D for the example above cited is then

$$D = dtS_c = 0.6875 \times 0.25 \times 95,000 = 16,328 \text{ lb.}$$

The Efficiency of the Riveted Section.—We now see that the riveted section weakens the solid plate

in three ways. In the first place, the boiler may give way more easily because a section equal to the rivet hole has been cut from the solid plate. In the second place, the rivet may be actually sheared in two, and



A SINGLE RIVETED LAP JOINT FOR BOILER PLATES

By taking into consideration the stresses involved in a sectional distance equal to the pitch of the rivets, P , as shown, we are enabled to deduce the safe working gauge pressure for boiler operation.

in the third place, it may be crushed longitudinally. The next thing to do then is to determine the ratio that each one of these factors bears to the strength of the solid plate and adopt the weakest or smallest ratio as the possible point where rupture will take place. Compute these three efficiency ratios for the joint E_j as follows:

$$E_j = \frac{B}{A}, = \frac{C}{A}, = \frac{D}{A} \dots\dots\dots (5)$$

Rule III. Divide the strength of the weakest section by the strength of the solid plate. (See Rule I). The result is the efficiency of the riveted section.

Thus in the example cited we have seen that the strength of the solid plate is 22,343 lb., that its strength between rivet holes is 12,890 lb., that the shearing strength is 16,332 lb. and that the crushing strength of the plate in front of one rivet is 16,328. Hence, the weakest place is in the strength between rivet holes and consequently the efficiency of joint E_j is

$$E_j = \frac{12,890}{22,343} = .578.$$

Gage Pressure Necessary to Burst the Solid Boiler Plate.—We come now to the most interesting point of our analysis, namely to compute the bursting pressure of the solid plate.

In the discussion of the strength of the solid boiler plate we found that the force of steam pressure acting so as to tear the boiler plate apart longitudinally would evidently prove most disastrous in bursting the solid boiler plate. Since the pressure of steam exerts itself equally in all direction, we shall compute the total pressure available in this particular direction as this would give us the critical pressure for our present consideration.

If the boiler is of length 1 inches and inner diameter D inches the area of steam pressure is Dl . Since now the boiler gage pressure is P_s lb. per sq. in., the total pressure of the steam would evidently be $P_s Dl$ lb. To resist the boiler tearing apart there is a strip of boiler metal on each side of length l and thickness t . Hence the total metallic area of resistance is 2 lt . If now the force of resistance offered by the metal is S^t lb. per sq. in., we have, when an explosion or bursting apart is about to take place, that this resistive pressure is 2 ltS_t .

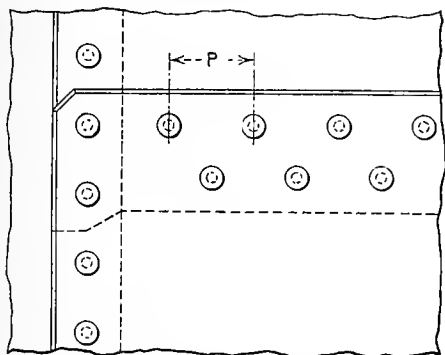
Equating these two pressures, we have

$$P_s D l = 2 l t S_t$$

$$\text{or } P_s = \frac{2 t S_t}{D} = \frac{t S_t}{D/2} \dots \dots \dots (6)$$

Thus we formulate.

Rule IV. Multiply the thickness of the plate by the tensile strength of the plate and divide by the radius (one-half of the diameter). The result is equal to the bursting pressure of the solid plate.



A DOUBLE RIVETED LAP JOINT

By introducing a number of rows of rivets for riveted lap joints the shearing strength and the crushing strength of the riveted section are proportionately increased, while the tensile strength of the net section remains the same.

In the example previously cited we now compute the bursting pressure of the solid shell of the boiler under consideration for a boiler diameter of 36 in. as follows:

$$P_s = \frac{t S_t}{D/2} = \frac{0.25 \times 55,000}{36/2} = 764 \text{ lb.}$$

This means that a gage pressure of 764 lbs. per sq. in. would rupture the given boiler if it existed without a riveted seam.

Bursting Pressure of the Seam.—But our boiler under consideration would evidently burst before the bursting pressure of the solid plate were reached for the riveted section has weakened its total strength. In Rule IV we found that the efficiency of the riveted joint is the ratio of the strength of the weakest point to the strength of the solid plate. Hence we have that the gage pressure P at which the boiler will probably rupture at the riveted joint is

$$P = P_s E_j \dots \dots \dots (7)$$

Rule V. Multiply the bursting pressure of the solid plate by the efficiency of the joint. This result is equal to the bursting pressure of the seam.

Thus since the efficiency of the joint E_j is found to be .578 and the bursting pressure P_s of the solid plate to be 764 lb., we have that the bursting pressure P of the joint which is the weakest part of the boiler construction is

$$P = P_s E_j = 764 \times .578 = 442 \text{ lb.}$$

The Safe Working Pressure.—Of course the boiler is never allowed to operate anywhere near this bursting pressure. A factor of safety is insisted upon. The U. S. tables are based upon a factor of safety of 3.5 for drilled holes and 4.20 for punched holes, which are the lowest factors allowed in any civilized country. The factor in most European countries is either

5 or 6. In any case, if factor of safety f is used, we have that the working pressure P_w is found from the formula

$$P_w = \frac{P}{f} \dots \dots \dots (8)$$

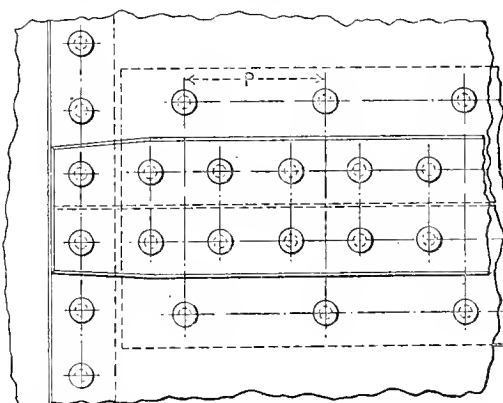
The rule advised by the Hartford Insurance Company's inspectors is as follows:

Rule VI. Divide the bursting pressure of the seam by the following safety factors: 0 to 125 pounds, 4.2; from 125 to 150 pounds, 4.5; 150 pounds or over, 5. The result is the safe working pressure under which the boiler is to operate. The American Society of Mechanical Engineers in their Boiler Code require a factor of safety of 5 for all new boilers.

Thus in the case at issue the safe working pressure P_w becomes

$$P_w = \frac{P}{f} = \frac{442}{4.2} = 105 \text{ lb.}$$

Recapitulating the discussion of the six rules, we now see in its completeness the method involved in computing the safe working pressure of a boiler. In



A DOUBLE RIVETED BUTT AND DOUBLE STRAP JOINT

In general the butt joint doubles the shearing strength of the joint while the net tensile strength and the crushing strength of the joint remain the same as in the lap joint discussion.

this particular instance we find that a boiler of 36 in. diameter, with $\frac{1}{4}$ in. plates and a single row of rivets spaced $1\frac{5}{8}$ in. apart may safely operate under 105 lb. pressure (gage).

Example of a Lap Joint, Longitudinal or Circumferential, Double-Riveted.—By similar reasoning we may now compute the efficiency of a lap joint which is double riveted whether longitudinal or circumferential. Thus, if the tensile strength of a boiler is stamped 55,000 lb. per sq. in. with thickness of plate $\frac{5}{16}$ in., pitch of rivets $2\frac{7}{8}$ in. diameter of rivet hole $\frac{3}{4}$ in., we have by applying our rules.

$$A = 2.875 \times 0.3125 = 55,000 = 49,414.$$

$$B = (2.875 - 0.75) 0.3125 \times 55,000 = 36,523.$$

$$C = 2 \times 44,000 \times 0.4418 = 38,878.$$

$$D = 7 \times 0.75 \times 0.3125 \times 95,000 = 44,531.$$

$$\therefore E_j = \frac{36,523}{49,414} = .739$$

ACTIVITIES OF PACIFIC COAST SECTION N. E. L. A.

(The Pacific Coast Section of the National Electric Light Association exists to render service to its members. But, successful rendering of service demands that each individual member do his part. First and most important of these parts is participation in what the association is doing. The association has prepared correspondence courses in salesmanship, electricity and accounting which are given to members only at nominal prices. The Section question box of "Problems and Solutions" is in need of questions and answers for publication in these columns. Each member also should write of how he has overcome some difficulty. Do not leave the work of carrying on the Section solely to the officers, but do your part in making the section activities more active.—The Editor.)

September has been a month of great activity for the Section committees and officers. The engineering committee met at San Francisco September 4 and 5, the executive committee at Los Angeles, September 15th and the commercial committee at San Francisco September 21st, important business being transacted in each case. Chairman J. E. Woodbridge and S. J. Lisberger officially represented the engineering committee at the Spokane meeting of the N. W. Electric Light & Power Association, S. M. Kennedy being there as a representative of the public policy committee. W. M. Deming, master of transportation, arranged for a special car direct to the convention and took excellent care of the score of members who went to Spokane from San Francisco. During the month also a complete roster of Section members was published and mailed.

Engineering Committee Meeting

Inductive interference orders, a new safety code and further tests on insulators were the main topics of discussion at the engineering committee on September 4th and 5th. All but four of the thirteen members were present,—Chairman J. E. Woodbridge, H. A. Barre, R. S. Cunningham, J. P. Jollyman, J. A. Koontz, S. J. Lisberger, L. M. Klauber, C. O. Poole and J. G. Scrugham, as well as President H. F. Jackson and Secretary A. H. Halloran.

President Jackson announced that the California power companies will contribute \$500 monthly for such engineering and research work as might be recommended by the engineering committee and approved by the contributing companies.

Chairman Woodbridge reported that a part of the fund of \$1500 previously contributed by California power companies for a study of the deterioration of insulators at Stanford University was still available and with a part of the new appropriation might with advantage be devoted to an extension of that work along lines recommended by Professor Harris J. Ryan. This recommendation covers a series of tests of the effects of accelerated cyclic changes in temperature on suspension elements of various makes, both with and without hardware. A discussion of this program indicated that recent improvements in the manufacture of porcelain appear to have eliminated porosity as the cause of insulator failures. The trouble experienced with porcelain of recent manufacture appears to be due to strains set up by thermal expansion and contraction, which strains cause minute cracks, into which moisture subsequently penetrates, resulting in failures.

Upon motion regularly made, seconded and carried, Chairman Woodbridge appointed Messrs. Koontz, Poole and Jollyman a sub-committee to confer with Professor Ryan on the procedure and costs of tests to obtain further information on this problem and to co-operate in the investigation. The same committee was instructed to report on the subject of suitable strain insulators for use in guy wires of high voltage lines.

The provisional report of the Joint Committee on Inductive Interference to the California State Railroad Commission was exhaustively discussed, objections being raised to the provisions regarding the distribution of cost and to the section outlining factors determining the definition of a parallel. The sub-committee was instructed to hold up further action pending advice by the legal departments of the power companies.

The sub-committee previously appointed to draw up recommendations to the California State Railroad Commission on rules to be incorporated in the Overhead Line Safety Code reported on its work to date, including a provisional draft of specifications on loading, safety factors, clearances, and details of construction of power lines with special provisions for crossings. Definite recommendations were adopted.

In order to render practice in the matter of treatment of conflicts and interference between overhead lines more consistent as between the several companies, and to obtain a list of precedents for reference purposes, the members of the committee were instructed to advise the chairman of action taken in all cases of this character.

Further sub-committees were appointed and instructed as follows: Messrs. S. J. Lisberger and L. M. Klauber to draft specifications for the purchase of timber for pole use as a substitute for cedar, with special reference to Douglas fir, including the preservative treatment therefor.

Mr. R. C. Powell was instructed to compile all available pertinent data on the properties of iron wires and cables, applicable to their use as line conductors.

Messrs. Cunningham and Klauber were instructed to recommend standard pintype insulators of the available makes for the practical range of line voltages, with the aim of reducing manufacturers' stocks on the Pacific Coast to a smaller number of types than those made necessary by independent choice.

There being no further business the committee adjourned after a session of one and a half days.

Executive Committee Meeting

An informal meeting of the available members of the executive committee was held September 15th, at Los Angeles. President H. F. Jackson, Vice-President E. R. Davis, Treasurer A. N. Kemp, Secretary A. H. Halloran, R. H. Ballard, Wm. Baurhyte, D. E. Harris, H. C. Reid, K. E. Van Kuran and A. E. Wishon being present.

President Jackson referred to the report of the petroleum committee of the State Council of Defense and then briefly abstracted the treasurer's report, wherein it was noted that the income for the year, exclusive of an advance subscription of \$1500, is sufficient to meet the probable outgo, but in view of the close margin it was decided not to return the subscriptions until after the next convention.

President Jackson then epitomized the work of the membership, engineering and commercial committees. He reported that Chairman J. E. Woodbridge and S. J. Lisberger were attending the meeting of the Northwest Light & Power Association in order to bring about unanimity of thought and action on inductive interference and safety code problems.

In response to the secretary's request for suggestion as to what additional work the Section should undertake to benefit the membership he was instructed to prepare a circular calling attention to the association's correspondence courses and urging members to write articles of local interest.

President Jackson here introduced a letter from Chairman S. V. Walton of the commercial committee outlining a plan for a co-operative sales campaign in conjunction with the contractor-dealers and the jobbers, this being in accord with a resolution adopted at the Riverside convention. The contractor-dealers and jobbers are in a position to pledge \$5000 to start such a campaign and it is hoped that the central stations will assure financial support so as to insure a fund of at least \$10,000 to be expended under the direction of a committee consisting of a central station man, jobber and contractor-dealer.

Upon motion by R. H. Ballard the final plans as adopted by the commercial committee will be submitted to the central stations interested and the matter left to their individual action. President Jackson emphasized the fact that the spirit of the resolution should be borne in mind and followed in general even if this particular plan were not adopted. In response to a question by K. E. Van Kuran, D. E. Harris stated that California contractor-dealers during the past six months have sold devices consuming more than 5000 kw.

President Jackson then stated that invitations for holding the next convention had been received from Albuquerque, Santa Rosa and Santa Cruz. He also suggested the possibility of Modesto or Del Monte, while A. E. Wishon suggested Fresno. After a general discussion it was decided to get more suggestions before making final decision. Whereupon the meeting adjourned.

Commercial Committee

Chairman S. V. Walton called a meeting at San Francisco on September 21, J. B. Black, L. H. Newbert, M. L. Scobey, M. S. Orrick, R. M. Alvord, G. B.

McLean, E. B. Criddle, R. M. Alvord and Secretary A. H. Halloran being present. Chairman Walton explained the purpose of the meeting as being to devise a plan for a co-operative sales, advertising and educational campaign to be handled by the California Association of Electrical Contractors and Dealers, assisted by the electrical jobbers and central stations.

After an extended discussion the committee recommended a definite plan of campaign for the consideration of the two associations affected.

PROBLEMS AND SOLUTIONS

Please furnish recent experience in adopting the system of continuous meter reading. We are about to change from bi-monthly readings and wish suggestions for accomplishing the change smoothly.

What is the load factor, diversity factor and demand factor of electric range installations in connection with house lighting?

In what spirit should public utilities meet municipal overtures to take over local distribution lines?

R. H. Ballard, So. California Edison Co.: I believe best results will be obtained when public utilities meet such municipal overtures in the spirit of co-operation with a view to demonstrating just what is best for the municipality and for the rate payers. As a rule such overtures are based upon misunderstanding of results which may be obtained through municipal operation of local distributing lines. Through calm and thorough investigation and discussion, these misunderstandings can usually be corrected. A refusal to meet with municipal authorities or the maintenance of a biased and antagonistic attitude in such meetings only tends to create prejudice against the utility and increase the stock of misinformation and misunderstanding.

C. 3. What effect is anticipated on current consumption for electric cooking and water heating if the high prices and scarcity of oil and coal continue?

S. M. Kennedy, Southern California Edison Co., Los Angeles: There are so many advantages in connection with the use of electricity for cooking that the pleased consumer with the electric range is the cause of a steadily increasing demand for electric cooking service. This condition is not a theory but a solid fact. With an increase in the prices of all other fuels, the demand for electricity as a fuel should, and will undoubtedly, increase much more rapidly, not only because electricity is stable as to price, but because its utility as a fuel for household cooking and heating purposes has been demonstrated to be practicable and desirable for many reasons which effect the taste, health and pocket book.

The largest electrolytic zinc plant in the world has been built by the Anaconda Copper Mining Company at Great Falls, Montana. This plant has a capacity of 160 to 175 tons of zinc daily. Crediting the value of the recovered silver, gold, lead and copper the cost of production is low enough to compete with the retort process under normal conditions.



Delegates and Guests of the Tenth Annual Convention of the Northwest Electric Light and Power Association and

CONVENTIONS OF ELECTRICAL MEN IN THE NORTHWEST

It was a remarkable gathering of men of the industry that met at Spokane, Washington, during the past two week period. The joint session of the Northwest Electric Light & Power Association with the Washington Association of Electrical Contractors & Dealers proved exceptionally helpful. The strong attendance of manufacturers proved also of unusual profit in that the electric range situation was as a consequence clarified to a degree hitherto unaccomplished in the West.

M. C. OSBORN, President of the Northwest Electric Light & Power Association, who proved himself an able and efficient executive in bringing to a conclusion the most successful and helpful convention in the history of the association.

This Tenth Annual Convention of the Northwest Electric Light & Power Association, which has just concluded its session at Spokane, will go down into the history of the electrical industry in the Northwest as a distinct advance in affairs electrical in that section of the country.

The meeting was called to order by President M. C. Osborn promptly on schedule time Wednesday morning at ten o'clock in the beautiful Hotel Davenport.

The president, in well chosen words, called attention to the serious aspects of the electrical industry in relation to world affairs and asked the convention delegates to rise and sing the Star Spangled Banner as the great flag at the head of the hall was unfurled by two boy scouts appropriately dressed for the occasion.

President Osborn in his address dwelt upon the fact that, due principally to the increased activities of the industry, it was felt by all in position to know, that the central stations, both in the larger cities and in the towns of the Northwest, were on the eve of a long season of unusual prosperity and activity.

There were in attendance at the convention over two hundred and fifty delegates and guests. The second annual convention of the Washington Association of Electrical Contractors & Dealers was also held simultaneously in Spokane. Several of the meetings were joint sessions with the Northwest Electric Light & Power Association.

Perhaps the greatest outstanding feature of the convention was this evident growth in a spirit of get-together between all members of the industry—the central station, the contractor and dealer, the jobber and the manufacturer.

The papers delivered were read as scheduled and previously announced in the technical press.

After conclusion of this preliminary session on Wednesday, September 12, the convention again convened promptly at 2 o'clock in the afternoon, when

the reading and discussion of an exhaustive paper on "Practical Central Station Salesmanship," by L. A. McArthur, chairman-editor, assisted by Geo. Bowen, S. H. Hoag, W. H. Line, Lewis A. Lewis, and C. R. Young, took place. This paper clearly defines the field and policy of a power company in the sale of appliances. Emphasis is placed on advertising, appliance value as cost, plans for selling ranges and approved methods of operating an electric store.



J. F. FARQUHAR, Secretary-Treasurer of the Northwest Electric Light & Power Association, whose ability in handling without confusion, the many details incident to the consummation of a successful convention was well demonstrated at the Spokane gathering.

In the discussion W. R. Putnam of the Utah Light & Power Company brought home the neces-



1st Annual Convention of the Washington Association of Electrical Contractors and Dealers at Spokane, Washington.

sity of injecting consideration of the "kiddies" into the plans for a sales campaign, as their interest once aroused, he claimed, will add greatly to the gaining of entrance in the home for extended installations of household appliances.

"How the Engineer Can Assist the Commercial Department" was the subject of the session on Thursday morning. This paper, by D. F. Henderson, chairman-editor, and G. L. Duffy, H. C. Henkle, A. S. Hall and L. T. Merwin, is filled with valuable data on the distribution system requirements of various appliances, including ranges and water heaters. Cost figures are a prominent feature. The gist of the arguments is that the engineer's figures of construction costs and his co-operation in reducing them should be the basis of all new business efforts.

The discussion that followed brought out the fact that the cultivation of intimate relations between the commercial and engineering departments is very essential. As one of the members put it, he always invited one of the engineers to go with him when he went fishing instead of a man from his own commercial department. In other words, whether it be called co-ordination or synchronism, the closest co-operation between engineering department and commercial department brings the best results.

On Thursday afternoon A. C. McMicken, H. H. Schoolfield, L. R. Grant, F. O. Boili and Foster Russell presented a paper on "Co-operation in Modern Home and Apartment House Wiring." This shows that in the past no concerted effort has been made to increase the number of baseboard outlets in new houses and apartments. Suggestions are given whereby central stations may secure the co-operation of architects and contractors to this end.

This session, composed also of the delegates to the second annual convention of the Washington Association of Electrical Contractors & Dealers, proved a most lively one. The discussion emphasized that education of the architect to the needs of modern house wiring was not only an excellent thing but Mrs. Cooley, one of the women delegates, most forcefully pointed to the necessity of educating the consumer in the method electrical. This, she claimed could best be brought about by teaching the children in the schools the many uses of electricity.

On Thursday evening F. D. Fagen, Pacific Coast manager of the Edison Lamp Works, gave an illustrated lecture on "Commercial and Residential Illumination." Beautiful slides and moving pictures were

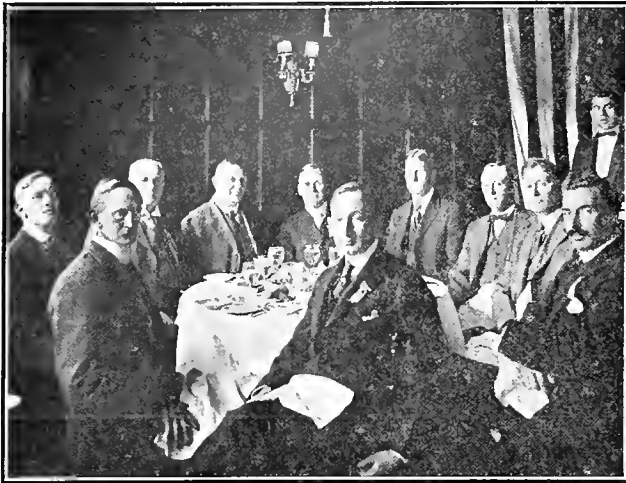


FACSIMILE OF THE SERVICE ISSUE OF THE JOURNAL OF ELECTRICITY, distributed gratis for the forwarding of the best interests of the electrical gatherings at Spokane. This little issue of twenty pages, 5 by 7 in. in size and the September issue of the Journal of Electricity, devoted to the papers and discussions of the convention, so won their way into the hearts of those gathered at the convention that the chairman of the convention temporarily called off its discussions in order to fully express the appreciation of the convention members and their guests. In addition to this an enthusiastic vote of appreciation was passed by the convention members themselves and, at the banquet following, the chairman called upon a representative of the Journal for a few remarks stating that the Journal had been the leading factor in bringing about the remarkable success of the gathering.

exhibited by the lecturer which set forth in an interesting and entertaining manner the essential features of correct and artistic illumination.

"The report of the Electric Range Committee," W. R. Putnam, chairman-editor, occupied Friday's sessions, both morning and afternoon. This included the report of several sub-committees—"Merchandising," "Possible Improvements," in burners, ovens and

general design of ranges; "Routine," handling of orders, billing, maintenance and follow-up work; "Com-



A GROUP OF PROMINENT MEN AT THE SPOKANE CONVENTION. (Reading from left to right): J. F. Farquhar, J. B. Fiske, M. C. Osborn, O. B. Coldwell, P. A. Bertrand, S. J. Lisberger, C. P. Osborn, J. C. Martin, J. E. Woodbridge.

mercial Baking and Cooking," including qualifications and compensation; "Advertising" and "Electric Water Heating."

Papers were also presented on "Comparative Tests of Cooking Fuels," by B. L. Steele, and "Bus-Bar Density of Ranges" by H. B. Peirce. The paper of Professor B. L. Steele, who is professor of physics at Washington State College, was generally considered the best piece of scientific information presented at the convention and points conclusively to the ultimate economic triumph of the electric range in many districts of the West. In the discussion, M. C. Osborn, president of the convention, who is commercial agent for the Washington Water Power Company, quoted statistics from the intensive range campaign initiated by his company some months back, which goes to indicate that the company is well in line for the installation of the ten thousand ranges by 1922, according to their slogan adopted at that time. He stated that out of 800 ranges installed, upon which data had been kept, only four had been returned as unsatisfactory, although about fifty had been returned for financial and other reasons. He also stated that his company was absolutely convinced, after many months of careful investigation, that a good electric range properly installed, is economically far superior to any other type of range, at least according to conditions prevailing in his territory.

The banquet on Friday evening and the trip to the Bunker-Hill and Sullivan mine on Saturday were participated in by both the power association and by the contractors and dealers. The joint banquet proved to draw out a closer spirit of co-operation for future work, while the trip to the great mine was a real education in the trend of modern electrical application.

The new officers elected for the two organizations for the coming year are as follows:

Guy W. Talbot of the Pacific Light & Power Company, Portland, was the unanimous choice for president of the association at the closing session of the convention. Portland was selected as the city

to entertain. Other officers unanimously elected by the convention are: J. S. Thornton, Raymond, vice-president for Washington; W. E. Coman, Portland, vice-president for Oregon; William Wallace, Boise, vice-president for Idaho; J. F. Roche, Butte, vice-president for Montana; J. B. Faulkner, Olympia; George E. Gramb, Wenatchee, and B. A. Bertrand, Aberdeen, members of the executive committee for the three-year term ending 1920. Louis A. McArthur, Portland, and H. L. Waither, Medford, Ore., members of the executive committee, were elected to fill the unexpired terms of Messrs. Davidson and Kinkan.

Convention Registration

Delegates and guests at the Tenth Annual Convention Northwest Electric Light & Power Association, Spokane, September 12-15, 1917:

P. J. Aaron, Fobes Supply Co., Seattle, Wash.
Miss Laura Addison, W. W. P. Co., Spokane, Wash.
R. M. Allen, N. C. Power Co., Seattle, Wash.
R. M. Alvord, G. E. Co., San Francisco, Cal.
H. R. Anderson, W. W. P. Co., Spokane, Wash.
Ross Anderson, W. W. P. Co., Palouse, Wash.
Guy Arthur, W. W. P. Co., Ritzville, Wash.
C. V. Aspinwall, Westinghouse Elec. Seattle, Wash.
Thos. G. Aston, W. W. P. Co., Spokane, Wash.
Lee F. Austin, Austin-McCain Co., Spokane, Wash.
F. N. Averill, Fobes Supply Co., Portland, Ore.
B. P. Bailey, Pacific U. & L. Co., Dallas, Ore.
H. L. Bargion, Mont. Elec. Co., Butte, Mont.
G. W. Barthell, W. W. P. Co., Tekoa, Wash.
Mrs. Geo. Barthell, Tekoa, Wash.
E. C. K. Baughn, P. P. & L. Co., North Yakima, Wash.
T. A. Bayless, G. E. L. & P. Co., Grangeville, Idaho.
G. R. Beckman, W. W. P. Co., Moscow, Idaho.
J. C. Beeckman, W. W. P. Co., Spokane, Wash.
C. E. Beckwith, W. W. P. Co., Sprague, Wash.
Mrs. C. E. Beckwith, Sprague, Wash.
W. S. Berry, Western Elec. Co., San Francisco, Cal.
P. A. Bertrand, Gray Harbor El. Co., Aberdeen, Wash.
T. E. Bibbins, Pac. States Elec. Co., San Francisco, Cal.
H. L. Bleecker, W. W. P. Co., North Yakima, Wash.
Geo. A. Boring, Pac. States Elec. Co., Portland, Ore.
Geo. G. Brown, N. W. Elec. Co., Portland, Ore.
John Bowen, W. W. P. Co., Spokane, Wash.
N. A. Bowers, Elec. World, San Francisco, Cal.
R. M. Boykin, N. Coast Pr. Co., Portland, Ore.
Mrs. R. M. Boykin, Portland, Ore.
M. W. Brickett, W. W. P. Co., Spokane, Wash.
Mrs. M. L. Burgess, W. W. P. Co., Spokane, Wash.
J. A. Byers, W. W. P. Co., Spokane, Wash.
Harry Byrne, N. C. E. Co., Seattle, Wash.
R. W. Cabill, Portland Ry., Lt. & Pr. Co., Portland, Ore.
F. A. Correll, S. H. L. & P. Co., Spokane, Wash.
A. U. Carlson, W. W. P. Co., Davenport, Wash.
Mrs. A. R. Carlsen, Davenport, Wash.
J. A. Carmichael, W. W. P. Co., Spokane, Wash.
J. M. Chamberlain, Fobes Supply, Portland, Ore.
C. W. Chestnut, West. Elec. Co., Seattle, Wash.
A. M. Chitty, P. S. T. L. & P. Co., Everett, Wash.
W. L. Chrysler, W. W. P. Co., Wilbur, Wash.
R. W. Clark, P. S. T. L. & P. Co., Seattle, Wash.
O. W. Clingerman, North Idaho & Mont. Pr. Co., Tacoma, Wash.
O. O. Coffman, W. W. P. Co., Spokane, Wash.
O. B. Coldwell, P. R. I. & P. Co., Portland, Ore.
J. W. Conley, W. W. P. Co., Spokane, Wash.
L. J. Corbett, University of Idaho, Moscow, Idaho
G. S. Covey, W. W. P. Co., Spokane, Wash.
Miss Ann W. Cross, G. E. Co., Missoula, Mont.
J. D. A. Cross, G. E. Co., Pittsfield, Mass.
A. H. Crowell, Wash. Elec. Supply, Spokane, Wash.
W. J. Currie, W. W. P. Co., Spokane, Wash.
Miss Nellie Curtis, G. E. Co., Spokane, Wash.
D. V. Cushman, W. W. P. Co., Colfax, Wash.
R. S. Daniels, W. W. P. Co., Spokane, Wash.
W. A. Davis, City Hall, Spokane, Wash.
W. M. Deming, Journal of Electricity, San Francisco, Cal.
F. P. Dexter, P. S. L. & P. Co., Seattle, Wash.
Jas. B. Dodge, W. W. P. Co., Spokane, Wash.
J. N. Doherty, W. W. P. Co., Spokane, Wash.
Elmer Dover, H. M. Byllesby Co., Tacoma, Wash.
H. A. Dowe, Marshall-Wells Hardware Co., Spokane, Wash.
G. I. Drennan, P. P. & L. Co., Toppenish, Wash.
R. R. Easter, Hillsboro, Ore.
L. D. Eckard, S. H. L. & P. Co., Spokane, Wash.
Albert H. Elliott, Elliott Hot Air & Gas Co., San Francisco, Cal.
E. Enloe, Okanogan Valley L. & P. Co., Spokane, Wash.
F. D. Fagan, G. E. Co., San Francisco, Cal.
J. F. Farquhar, W. W. P. Co., Spokane, Wash.
C. M. Fassett, City Commissioner, Spokane, Wash.
E. L. Ferguson, W. W. P. Co., Spokane, Wash.
H. B. Ferris, S. H. L. & P. Co., Spokane, Wash.
J. G. Finney, W. W. J. Co., Spokane, Wash.
J. B. Fiske, W. W. P. Co., Spokane, Wash.
Marguerite Fleming, N. W. Elec. L. Co., Portland, Ore.
F. L. Fowler, Arthur S. Fowler Co., Ritzville, Wash.
W. F. Garby, Auto. Elec. Faucet Co., San Francisco, Cal.
S. E. Gates, G. E. Co., Spokane, Wash.
C. G. Gilster, Wash. Elec. Supply Co., Spokane, Wash.
B. C. Grant, W. W. P. Co., Garfield, Wash.
Henry L. Gray, C. E., Seattle, Wash.
John L. Gray, W. W. P. Co., Spokane, Wash.
Robert Gray, W. W. P. Co., Colfax, Wash.
Mrs. Robert Gray, Colfax, Wash.
W. J. Grambe, P. S. L. & P. Co., Seattle, Wash.
V. H. Greisser, W. W. P. Co., Spokane, Wash.

E. Gump, W. W. P. Co., Lind, Wash.
 George Harding, Spokane, Wash.
 F. A. Harman, Eastern Ore. Lt. & Pr. Co., Baker, Ore.
 Mrs. F. A. Harman, Baker, Ore.
 L. V. Harper, Chelan Elec. Co., Chelan, Wash.
 P. Hayward, W. W. P. Co., Spokane, Wash.
 D. F. Henderson, W. W. P. Co., Spokane, Wash.
 S. G. Hepler, Arrow Elec. Co., Seattle, Wash.
 Milt Herrock, E. Pittsburg, Pa.
 J. H. Hole, W. W. P. Co., Spokane, Wash.
 T. E. Holsey, W. W. P. Co., Spokane, Wash.
 G. H. Hoppin, W. W. P. Co., Spokane, Wash.
 Harold Hudson, W. W. P. Co., Moscow, Idaho.
 Geo. A. Hughes, Hughes El. Co., Chicago, Ill.
 Mrs. Geo. A. Hughes, Chicago, Ill.
 Earl R. Hunt, W. W. P. Co., Spokane, Wash.
 W. F. Hynes, G. E. Co., Portland, Ore.
 A. F. Irwin, W. W. P. Co., Spokane, Wash.
 J. B. Ingersoll, S. H. L. & P. Co., Spokane, Wash.
 R. L. Jacobs, W. W. P. Co., Spokane, Wash.
 A. H. Jaeger, Hotpoint Elec. Co., Seattle, Wash.
 John J. Jennings, W. I. W. L. Po. Co., Lewiston, Idaho.
 Mrs. John J. Jennings, Lewiston, Idaho.
 W. H. John, S. H. L. & P. Co., Spokane, Wash.
 W. E. Jones, Economy Fuse & Mfg. Co., Seattle, Wash.
 T. R. Jump, Elec. Sales Service Co., San Francisco, Cal.
 N. A. Kemmish, Spokane Service Co., Spokane, Wash.
 Ludwig Kemper, S. H. L. & P. Co., Spokane, Wash.
 Mrs. Ludwig Kemper, Spokane, Wash.
 Mrs. S. M. Kennedy, Los Angeles, Cal.
 S. M. Kennedy, So. Cal. Edison Co., Los Angeles, Cal.
 Blaine L. Kerns, Westinghouse El. & Mfg. Co., Seattle, Wash.
 J. F. Kinder, Elec. Co., Portland, Ore.
 L. W. Kingsbury, W. W. P. Co., Pullman, Wash.
 G. A. Kumlir, G. E. Co., Portland, Ore.
 Mrs. G. A. Kumlir, G. E. Co., Portland, Ore.
 L. C. Lamont West. Elec. & Mfg. Co., Butte, Mont.
 A. D. Leach, N. W. Elec. Co., Portland, Ore.
 L. A. Lewis, W. W. P. Co., Spokane, Wash.
 J. D. Lewis, W. W. P. Co., Palouse, Wash.
 S. J. Lisberger, Pac. Gas & Elec. Co., San Francisco, Cal.
 G. D. Longmuir, West. Elec. Co., Seattle, Wash.
 C. A. Lund, W. W. P. Co., Spokane, Wash.
 V. E. McCain, W. W. P. Co., Colfax, Wash.
 N. W. Macduff, P. P. & L. Co., North Yakima, Wash.
 H. H. Many, Baker-Joslyn Co., Seattle, Wash.
 B. F. Marsh, W. W. P. Co., Spokane, Wash.
 Geo. J. Marsh, Marshall-Wells Hardware Co., Spokane, Wash.
 J. C. Martin, P. P. L. & P. Co., Portland, Ore.
 W. J. Martin, W. W. P. Co., Harrington, Wash.
 A. M. P. Maschmeyer, Hughes Elec. Co., Portland, Ore.
 B. M. Merrill, W. W. P. Co., Spokane, Wash.
 C. W. Miller, W. W. P. Co., Spokane, Wash.
 M. T. Miller, W. W. P. Co., Spokane, Wash.
 Chas. R. Mitchell, W. W. P. Co., Spokane, Wash.
 S. E. Mitchell, G. E. Co., Seattle, Wash.
 A. S. Moody, G. E. Co., Portland, Ore.
 L. E. Morse, W. W. P. Co., Spokane, Wash.
 J. W. Moss, W. W. P. Co., Spokane, Wash.
 R. F. Monges, City Trans. Co., Rep. G. E. Co., Portland, Ore.
 Austin Morey, Lewiston, Idaho.
 Mrs. Austin Morey, Lewiston, Idaho.
 Geo. B. Muldaur, Field Sec. N. E. L. A., New York, N. Y.
 G. C. Mundslay, Nat. Carbon Co., Seattle, Wash.
 E. M. Murphy, Westinghouse Mfg. Co., Spokane, Wash.
 F. H. Murphy, Portland Ry., Lt. & Pr. Co., Portland, Ore.
 C. S. MacCalla, W. W. P. Co., Spokane, Wash.
 W. B. MacDonald, Mont. L. & P. Co., Kalispell, Mont.
 Lewis A. McArthur, Pac. P. & L. Co., Portland, Ore.
 Mahlon McCain, Austin-McCain Co., Spokane, Wash.
 W. D. McDonald, Westinghouse Elec. Co., Seattle, Wash.
 Mrs. W. D. McDonald, Seattle, Wash.
 R. B. McElroy, W. W. P. Co., Spokane, Wash.
 A. C. McMicken, P. R. L. & P. Co., Portland, Ore.
 F. J. Nagle, W. W. P. Co., Uniontown, Wash.
 B. L. Neill, So. Pacific Ry., Spokane, Wash.
 Thos. W. Neill, Kootenai Pr. Co., Coeur d'Alene, Idaho.
 H. R. Noack Pacific States Elec. Co., San Francisco, Cal.
 J. F. NePage NePage McKenny Co., Seattle, Wash.
 Bernhard Olsen, Gen. El. Co., Spokane, Wash.
 G. L. Oman, G. E. Co., Portland, Ore.
 M. C. Osborne, W. W. P. Co., Spokane, Wash.
 C. P. Osborne, P. R. L. & P. Co., Portland, Ore.
 F. T. Parker, Pac. P. & L. Co., Bend, Ore.
 O. B. Penrose, Robes Supply Co., Portland, Ore.
 W. E. Peters, West. Elec. Co., Spokane, Wash.
 H. G. Peterson, H. W. Johns-Manville Co., Spokane, Wash.
 H. E. Plank, G. E. Company, Seattle, Wash.
 W. B. Putnam, Utah L. & P. Co., Salt Lake, Utah.
 G. E. Quinan, P. S. T. L. & P. Co., Seattle, Wash.
 D. E. Rae, P. P. & L. Co., Kennewick, Wash.
 E. L. Rever, Wood & Rever Inc., Seattle, Wash.
 E. H. Richardson, Hotpoint Elec. Co., Ontario, Cal.
 Miss Ardis Richardson, Ontario, Cal.
 Mrs. E. H. Richardson, Ontario, Cal.
 H. T. Van Riper, Hot Point El. Co., Seattle, Wash.
 Chas. Robinson, W. W. P. Co., Spokane, Wash.
 Gretta Robinson, W. W. P. Co., Spokane, Wash.
 J. F. Roche, Mont. Pr. Co., Butte, Mont.
 Geo. N. Rooker and wife, No. Idaho & Mont. Pr. Co., Sandpoint, Idaho.
 J. E. Royer, W. W. P. Co., Spokane, Wash.
 Foster Russell, W. W. P. Co., Spokane, Wash.
 Frank E. Ryan, S. H. L. & P. Co., Spokane, Wash.
 L. A. Safford, P. P. & L. Co., Sunnyside, Wash.
 Geo. C. Sawyer, P. P. & L. Co., North Yakima, Wash.
 R. E. Scholer, W. W. P. Co., Odessa, Wash.
 H. H. Schoolfield, P. P. & L. Co., Portland, Ore.
 J. H. Siegfried, P. P. & L. Co., Portland, Ore.
 Mrs. J. H. Siegfried, Portland, Ore.
 W. L. Scott, W. W. P. Co., Spokane, Wash.
 J. D. Scott, P. R. L. & N. P. Co., Portland, Ore.
 M. Sebern, Wash. Elec. Supply Co., Spokane, Wash.
 R. C. Shipman, Nat. Elec. Utility Inc., Seattle, Wash.

V. G. Shinkle W. W. P. Co., Spokane, Wash.
 I. A. Shorno, G. E. Co., Spokane, Wash.
 Lewis M. Shreve W. V. G. & E. Co., Wenatchee, Wash.
 Robert Sibley, Journal of Electricity, San Francisco, Cal.
 Mrs. Robert Sibley, San Francisco, Cal.
 L. M. Simpson, G. E. & P. Co., Grangeville, Idaho.
 W. W. Spangler, Westinghouse Elec. & Mfg. Co., Seattle, Wash.
 J. H. Sroufe Portland, Ore.
 M. F. Steel, Benjamin Elec. Mfg. Co., San Francisco, Cal.
 C. P. Stevens, Westinghouse Lamp Co., Seattle, Wash.
 W. W. Taliferro St. John, Wash.
 Mrs. Taliferro, St. John, Wash.
 H. J. Tinkham, Pac. Tel. & Tel. Co., Spokane, Wash.
 R. E. Thatcher, P. S. T. L. & P. Co., Seattle, Wash.
 W. R. Thomas, W. V. G. & E. Co., Wenatchee, Wash.
 J. R. Thompson, W. W. P. Co., Ritzville, Wash.
 R. E. Tompkins, W. W. P. Co., Spokane, Wash.
 C. H. Tompkins, W. W. P. Co., St. Marries, Idaho.
 R. M. Townsend, P. R. L. & P. Co., Portland, Ore.
 Mrs. R. M. Townsend, Portland, Ore.
 R. W. Turnbull, G. E. Co., Portland, Ore.
 C. C. Turley, P. P. L. & I. Co., Vancouver, Wash.
 Mrs. C. C. Turley, Vancouver, Wash.
 H. W. Turney Wash. Elec. Supply Co., Butte, Mont.
 C. F. Uhden, W. W. P. Co., Spokane, Wash.
 J. A. Vandegrift, Nat. Lamp Works, Oakland, Cal.
 W. C. Wagner, Bureau of Standards, Washington, D. C.
 Edmund D. Walker B. C. Elec. Ry. Co., Vancouver, B. C.
 Ed. Walsh, W. W. P. Co., Spokane, Wash.
 R. W. Watson, W. W. P. Co., Spokane, Wash.
 Chas. J. Weller, Grant Co. Pr. Co., Coulee City, Wash.
 H. E. West Portland G. E. Co., Portland, Ore.
 C. L. Wernicke, Westinghouse Elec. Co., Portland, Ore.
 Y. M. White, W. W. P. Co., Spokane, Wash.
 H. R. Williams, S. C. P. & L. Co., Colville, Wash.
 Roger Williams, W. W. P. Co., Wilbur, Wash.
 W. C. Wiscombe, W. W. P. Co., Spokane, Wash.
 J. W. Wood, W. W. P. Co., Spokane, Wash.
 J. E. Woodbridge, S. & San F. Pr. Co., San Francisco, Cal.
 C. M. Wright, Wash. Elec. Supply, Spokane, Wash.
 W. C. Wurfel, Westinghouse Lamp Co., San Francisco, Cal.
 Garnett Young, Tel. Elec. Equip. Co., San Francisco, Cal.
 C. R. Young, Pac. Lt. & Pr. Co., Portland, Ore.
 F. J. Zorn, Pac. States El. Co., Seattle, Wash.

The Washington Association of Electrical Contractors and Dealers

The Washington Association of Electrical Contractors & Dealers held a closing session in the Moorish room at the Davenport Hotel and elected the following officers: V. S. McKenny, Seattle, president; J. J. Agutter, W. M. Meacham and S. Hepler, vice-presidents for the Spokane division; H. C. Rothbach, vice-president for the Tacoma division; J. R. Martin, vice-president for the Bellingham division; Ralph Wiseman, vice-president for the Yakima division. William E. Chase of Spokane was selected to represent the association on the Pacific coast conference board.

The second annual convention of the Washington Association of Electrical Contractors and Dealers was held in Spokane at the same time as the convention of the Northwest Electric Light & Power Association. So interwoven have all affairs of the electrical industry become, it has proven greatly to the advantage of both organizations to hold sessions in joint gatherings. This convention of the electrical contractors and dealers surpassed in enthusiasm and helpfulness the fondest hopes of its leaders. Here is a list of the delegates and guests in attendance at the convention of Electrical Contractors & Dealers:

J. J. Agutter, J. J. Agutter Co., Seattle, Wash.
 J. Don Alexander, Alexander Elec. Co., Spokane, Wash.
 R. D. Allison Secretary and Treasurer of Association.
 Chas. Barrett, Barrett Elec. Co., Hillyard, Wash.
 J. A. Barry, C. H. E. Williams Co., Seattle, Wash.
 Geo. F. Bryant.
 Harry Byrne, North Coast Elec. Co., Seattle, Wash.
 M. V. Burr, Burr Elec. Co., Spokane, Wash.
 E. F. Coldren, Elec. Supply Co., Lewiston, Idaho.
 W. E. Chase, Wm. E. Chase Eng. Co., Spokane, Wash.
 A. F. Cook, Inland Elec. Co., Spokane, Wash.
 Geo. R. Cooley, Geo. R. Cooley Elec. Co., Seattle, Wash.
 W. A. Davis, City Elec. Inspector, Spokane, Wash.
 P. Defayter Power City Elec. Co., Spokane, Wash.
 Chas. A. Duncan, Duncan Elec. Co., Spokane, Wash.
 R. T. Evans, R. T. Evans & Co., Seattle, Wash.
 A. E. Griswold A. G. Elec. & Mfg. Co., Seattle, Wash.
 H. R. Harris, Fobes Supply Co., Seattle, Wash.
 S. G. Hepler, Arrow Elec. Co., Seattle, Wash.
 A. E. Griswold, A. G. Mfg. Co., Seattle, Wash.

W. E. Jones Economy Fuse Co., Chicago, Ill.
 Hugh L. Kimball, Kimball Elec. Co., Oakland, Cal.
 (Representing the California Association of Contractors and Dealers)

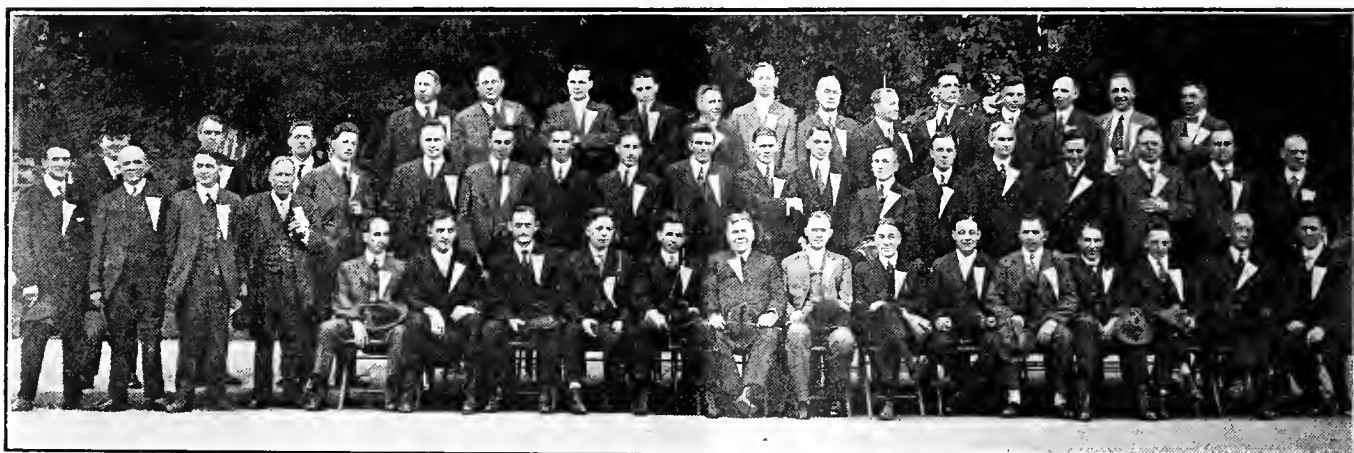
A. P. Kline, San Francisco, Cal.
 G. P. Labberton, North Yakima, Wash.
 Geo. Larson, Mills & Larson, Bellingham, Wash.
 R. K. LeGrand, Elec. Fixt. & Const. Co., Seattle, Wash.
 V. S. McKenny NePage & McKenny, Seattle, Wash.
 Mahlon McCain, Austin-McCain Co., Spokane, Wash.
 J. G. Maitland, Elec. Engineering Co., Seattle, Wash.
 J. L. Martin, Modern Elec. Co., Bellingham, Wash.
 W. M. Meacham, Meacham & Babcock, Seattle, Wash.
 D. J. Metcalf, Metcalf Elec. Co., Seattle, Wash.
 J. R. Mitchell Doerr-Mitchell Elec. Co., Spokane, Wash.
 T. P. Mosso, Spokane, Wash.
 E. G. Mundy, Mundy, Rolland & Co., Vancouver, B. C.
 (Representing the British Columbia Association of Contractors and Dealers)

C. O. Nelson Elec. Construction Co., Tacoma, Wash.
 J. F. NePage, NePage & McKenny, Seattle, Wash.
 Warren Oliver, Warren Oliver Elec. Co., Spokane, Wash.
 W. E. Peters, Western Elec. Co., Spokane, Wash.
 H. C. Rohrbach, Elec. Service Co., Tacoma, Wash.
 R. W. Rust, Rainier Elec. Engineering Co., Spokane, Wash.
 A. T. Shortley, Elec. Engineering Co., Spokane, Wash.
 Ferrester E. Smith, Secretary Contractors and Dealers Association, Seattle, Wash.
 J. H. Sroufe, NePage & McKenny Co., Portland, Ore.
 (Representing Oregon Association Contractors and Dealers)
 V. P. Sutherland, Miller's Mutual Fire Ins. Co., Seattle, Wash.
 Lewis C. Sutherland, Elec. Sup. & Fix. Co., Walla Walla, Wash.
 Hugh L. Tinling, Hutton, Tinling Elec. Co., Spokane, Wash.
 R. E. Wiseman Elec. Supply & Fixture Co., Ellensburg, Wash.

Member Companies Represented

Agutter, J. J. & Co., Seattle, Wash.
 Alley Electric Co., Seattle, Wash.
 Alexander Elec. Co., Spokane, Wash.
 Austin-McCain Co., Spokane, Wash.
 Arrow Electric Co., Seattle, Wash.
 Barrett, Chas., Hillyard, Wash.
 Burr Electric Co., Spokane, Wash.
 Chase Engineering Co., Spokane, Wash.
 Cooley, Geo. R. Electric Co., Seattle, Wash.
 Curran Electric Sign Co., Spokane, Wash.
 Doerr-Mitchell Electric Co., Spokane, Wash.
 Electric Construction Co., Tacoma, Wash.
 Electric Service Co., Tacoma, Wash.
 Electric Fixt. & Con. Co., Seattle, Wash.
 Electric Engineering Co., Seattle, Wash.
 Electric Supply & Fixture Co., Walla Walla, Wash.
 Evans, R. T. & Co., Seattle, Wash.
 Hutton, Tinling Electric Co., Co., Spokane, Wash.
 Inland Electric Co., Spokane, Wash.
 Labberton, G. P., North Yakima, Wash.
 Meacham & Babcock, Seattle, Wash.
 Metcalf, D. J. & Co., Seattle, Wash.
 Mills & Larson, Bellingham, Wash.
 Modern Electric Co., Bellingham, Wash.
 Mosso, T. P., Spokane, Wash.
 NePage, McKenny, Seattle, Wash.
 Power City Electric Co., Spokane, Wash.
 Puget Sound Traction, Light & Power Co., Seattle, Wash.
 Rainier Electric Co., Seattle, Wash.
 Spokane Heat, Light & Power Co., Spokane, Wash.
 Warren Oliver Electric Co., Spokane, Wash.
 Washington Water Power Co., Spokane, Wash.
 Williams, C. H. E., Seattle, Wash.

THE OREGON ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS



Delegates and Guests at the Eugene Convention of the Oregon Association of Electrical Contractors and Dealers

Co-operation and a spirit of mutual helpfulness seemed to be the keynotes struck at the second annual convention of the Oregon Association of Electrical Contractors & Dealers which was held at Eugene, Oregon, on September 17 and 18, with some fifty-five persons in attendance.

The three principal speakers at the banquet were Dr. S. D. Read of Eugene, Albert H. Elliott of San Francisco and Wm. C. Bristol of Portland.

The open meeting was held on the afternoon of September 17 at 2 o'clock and the following program was carried out:

Convention called to order at convention headquarters.

Address of welcome, J. E. Shelton, Esq., editor Eugene Guard and chairman of Publicity and Convention Bureau of Eugene Chamber of Commerce. Response, F. C. Green of Portland, Ore., president Oregon Association of Electrical Contractors & Dealers.

Paper, "Business Methods and Outlook," by C. D. Rorer, Esq., of Eugene, president Bank of Commerce Eugene, Ore.

Address, "Oregon's Electrical Industry," by Franklin T. Griffith, Esq., president Portland Railway, Light & Power Company.

Paper "The Need of Proper Electrical Inspection and How to Organize an Electrical Inspection Department," by F. Dunlap, Esq., of Portland, chief electrical inspector, Bureau of Buildings.

Paper, "The Electrical Jobber," by J. I. Colwell, Esq., Northwest manager Western Electric Company, Seattle Wash.

Paper, "The Electrical Contractor and Dealer," by J. H. Sroufe, of NePage, McKenny Co., Portland.

Albert H. Elliott delivered an address, his subject being "The Need of Organization to Satisfactorily meet the Growing Electrical Industry."

The business meeting was called to order by President F. C. Green at 9:30 a. m. September 18. A large volume of business was transacted and the election of officers for the coming year was held and resulted in the following being elected:

President: A. S. Halls, Miller & Halls, Portland.
 Vice-president, first district—S. C. Jaggard, Morrison Electric Company, Portland; J. H. Sroufe, Ne-

Page-McKenny Company, Portland; E. W. Pierce, Beaver Electric Company, Portland.

Vice-president, second district—B. W. Paul, Paul's Electric Store, Medford, Ore.

Vice-president, third district—John L. Vaughan, Pendleton Ore.

Executive Committee—Robert W. Larsen, M. J. Walsh Company, Portland; E. L. Knight, E. L. Knight & Co., Portland.

Delegate to Western Conference Board—J. H. Sroufe; Alternate, B. W. Paul.

Miscellaneous Notes

J. R. Mitchell of Doerr-Mitchell Company, Spokane, represented the Washington Contractors' Association at Eugene.

* * *

J. Chuckland of Vancouver, B. C., represented the B. C. Contractors' Association at the Oregon convention.

* * *

A mixed party (assortment of manufacturers and jobbers) left Eugene at the close of the convention for the upper part of the Willamette River. Watch for a sharp decline in the price of meat and fish and a marked increase in fish stories.

* * *

The speakers at the banquet Monday evening held the interest of the crowd until so late that the bowling match between the jobbers and contractors had to be abandoned.

* * *

J. H. Sroufe saw to it that every one became acquainted on the car going down.

* * *

Names Are Given of Men at Eugene Convention

W. G. Cumming of Cole & Cummings, Corvallis, Ore.
J. R. Ralston, of Ralston Electric Supply Co., Albany, Ore.
A. O. Nash, of Nash Electric Co., LaGrande, Ore.
B. W. Paul, of Paul's Electric Store, Medford, Ore.
Hugh Kimball, of Cal. Assn. of E. C. & D., Oakland, Cal.
J. Churchland, of British Columbia Association of E. C. & D., Vancouver, B. C.
J. R. Mitchell, of Doerr, Mitchell Elec. Co., Spokane, Wash.
J. I. Colwell, C. W. Chestnut and J. J. O'Reilly, of Western Electric Co., Seattle, Wash.
W. M. Deming, of Journal of Electricity, San Francisco, Cal.
E. M. Haig of Manhattan Electrical Supply Co., San Francisco.
S. B. Gregory, of Arrow Electric Co., San Francisco, Cal.
Albert H. Elliott, of Jobbers' Association.
C. M. Will, of Fobes Supply Co., Portland, Ore.
J. J. McCarthy, of Fobes Supply Co., Portland, Ore.
R. G. Cogley of Tel. Elec. Equip. Co., of Portland, Ore.
H. W. Floyd, Marshall-Wells Hardware Co., Portland, Ore.
John Ryan, of Western Electric Co., Portland, Ore.
M. H. Nichols, of Western Electric Co., Portland, Ore.
George Boring, R. P. Snoke, Wm. Werner and Fred C. Todd, of Pacific States Electric Co., of Portland, Ore.
Lyle G. Fear, of Westinghouse Elec. Co., Portland, Ore.
Carl F. Caufield of Local 18, I. B. E. W.
W. J. Dennit, G. E. Frey and L. H. Kennedy, of N. W. Elec. Co.
P. D. Weber, of Oregon Ins. Rating Bureau, Portland, Ore.
W. E. Conklin, of J. C. English Co., Portland, Ore.
W. S. Bridges, of M. J. Walsh Co., Portland, Ore.
S. W. Peterson, of Stubbs Electric Co., Portland, Ore.
C. P. Scott, of Scott Electric Co., Portland, Ore.
F. M. Vanderlip, of Vanderlip & Lord, Portland, Ore.
F. E. Meyers and H. L. Niles of H. M. H. El. Co., Portland, Ore.
I. B. Sturges, of Sturges & Olsaver, Portland, Ore.
C. C. Buchanan, of Portland Elec. Maintenance Co., Portland.
J. H. Sroufe, of NePage, McKenny Co., Portland, Ore.
J. E. NePage, of NePage, McKenny Co., Seattle, Wash.
F. C. Green, of E. L. Knight & Co., Portland, Ore.
Wm. H. Smith, of Smith-McCoy Electric Co., Portland, Ore.
R. R. Poppleton, Portland, Ore.
F. A. Bauman, of F. A. Bauman & Co., Portland, Ore.
J. R. Tomlinson, of Pierce-Tomlinson Elec. Co., Portland, Ore.
O. B. Coldwell of Portland Ry. Light & Power Co., Portland.
A. S. Halls, of Miller & Halls, Portland, Ore.
S. C. Jaggard, of Morrison Electric Co., Portland, Ore.
E. W. Pierce, of Beaver Electric Co., Portland, Ore.
S. Sanderson of Bryant Electric Co., San Francisco.
W. C. Bristol, of Portland, Ore.
P. B. Womeldurf, of Comet Electric Co., Eugene Ore.
J. W. Obender, Portland, Ore.
L. B. Sigwart, of Sigwart Elec. Co., Eugene, Ore.

UTAH SOCIETY OF ELECTRICAL CONTRACTORS

An invitation is extended to all interested to attend the first annual convention of the Utah Society of Electrical Contractors, which will be held at Salt Lake City, Friday and Saturday, October 5 and 6, 1917. Arrangements are in progress to make this one of the greatest gatherings of electrical men ever held in this city. It is planned to make this convention of great value to all electrical men throughout the state and we need you there to make it the success that is desired. The convention committees consists of J. V. Buckle, president; E. H. Eardley, secretary; G. J. Guiver, manager.

W. R. Putnam, salesmanager of the Utah Power & Light Company, is taking a keen interest in helping to make the convention a success.

The Utah Society of Electrical Contractors is organized for the purpose of bettering conditions in the contracting business. The society believes in the principle of "One for all and all for one," and advocates; a higher standard of business ethics; more business-like methods and standardization of business practices; more accurate methods of figuring costs, to the end that there may be fewer failures in the contracting business; highest standard of electric construction; "safety first" as a first consideration; peaceful adjustment of labor disputes, and greater co-operation among individuals in the contracting business.

PROGRAM FIRST SEMI-ANNUAL CONVENTION OF UTAH SOCIETY OF ELECTRICAL CONTRACTORS,

Salt Lake City, Utah, Oct. 5-6, 1917

Friday, 12 Noon

Luncheon in the ladies' dining room of the Salt Lake Commercial Club.

Address of welcome, President J. V. Buckle.

Address, Governor Simon Bamberger, Governor State of Utah.

Paper, Relationship of the Contractor to the Central Station—W. R. Putnam, Division Manager of Salt Lake City, W. P. & L. Company.

Paper, The Jobber and Its Relation to the Contractor—C. B. Hawley, General Manager of Inter-Mountain Electric Company. Why the Need of a State Organization, by E. H. Eardley, Eardley Bros. Company.

Two-minute discussions.

Adjournment.

State Fair.

8:00 p. m. Bowling at Quinn's Orpheum Hall, Contractors of Salt Lake vs. Electrical Jobbers; E. R. Dobb of the Capital Electric Company, captain of the Contractors' team; R. S. Folland of the Capital Electric Company, captain of Jobbers' team.

Good Morning.

Saturday, October 6th

2:00 p. m. Assembly Room, Salt Lake Commercial Club.

Election of Officers.

Address, Rev. P. A. Simpkins.

Paper, The Need of a State Electrical Inspection and Organization of a State Electrical Inspection Bureau—F. C. Winegar, chief electrical inspector, Bureau of Inspection of Salt Lake City, Utah.

Paper, G. J. Guiver, The Electrical Contractor.

Paper, The Electrical Industry, Lafayette Hanchett, County Commissioner of Salt Lake City.

Three-minute discussions.

Adjournment.

Take autos at Commercial Club for the site-seeing trip to the mammoth cantonment camp at Fort Douglas and seeing Salt Lake City.

6:00 p. m. Dinner at Commercial Club, compliments of Utah Power & Light Company.

8:00 p. m. Newhouse Hotel, dancing, music, refreshments. Good-bye

Committees

Constitution and By-Laws—W. R. Putnam, Utah Power & Light Co., Mr. Ackerman, Capital Electric Co.; C. R. Hawley, Inter-Mountain Elec. Co.; E. H. Eardley, Eardley Bros. Co.; G. W. Forsburg, Inter-Mountain Elec. Co.

Finance—E. H. Eardley, C. B. Hawley, W. R. Putnam, H. D. Randall, — Talmage, — Ackerman.

Entertainment—J. V. Buckle, G. J. Guiver, E. Brazier, Inter-Mountain Elec. Co.; Mr. Nicholl, Western Electric Co., F. C. Wolters.

Site-Seeing—James Swyers, L. C. Robbins, A. G. Hill, Jr. Bowling—R. S. Folland, Captain, Jobbers' team; E. R. Dobb, Captain, Contractors' team.

GERMANY'S AMERICAN ALLY

(A bulletin just issued by the National Board of Fire Underwriters contains startling information on the gigantic losses by fire in America. Men of the electrical industry can do much in the future to prevent much of this needless waste. Excerpts from this bulletin are given below summarizing this loss.—The Editor.)

Germany has a powerful ally working within the boundaries of the United States. Its operations are very effective. It enters munition plants and causes explosions. It cripples hundreds of factories which are laboring to produce war time necessities. It waits until the grain in the fields is ripe for harvest and then destroys it over thousands of acres, or else it bides its time until the harvested crops have been

A Patriotic Duty of Every American is to

PREVENT FIRE



America at war needs every ounce of her energy and resources. It is criminal to cause hazards; it is unpatriotic to neglect them. Here are some of the ways in which you can help:

1. Learn the factory safety rules and observe them.
2. If you discover a fire, give the alarm promptly. Do you know how to do this? Ask to be shown.
3. **Don't smoke** where it is not permitted.
4. Never drop a lighted match, cigar or cigarette; be sure that it has no spark left before throwing it away.
5. Report suspicious strangers seen about the plant.
6. If you notice any unusual smoke, the overheating of any machine, or any other accident, notify the foreman at once.
7. Carry your precautions into your own home; keep your house and yard free from rubbish, and help others to do the same.

Where would **your** job be if this plant should burn?

Help Uncle Sam

BE CAREFUL

Approved by the National Board of Fire Underwriters
Edited by the Council of National Defense

A Poster to Aid in Fire Prevention

stored in elevators, and obliterates them by the hundreds of thousands of bushels. It operates in every city and town, and in the country districts. It is unceasing in its activities, working by night as well as by day, and for every hour of the twenty-four. It enters countless homes, bringing devastation and sorrow; and last, but not least, it causes heavy loss of life.

This foe is not an "alien enemy," but comes of good American stock. It is encouraged by millions of people who believe themselves to be patriotic. Without their help, it would soon be overcome; for the name of this great enemy is Preventable Fire, and its principal cause is American carelessness.

Putting their average cost at \$7500 apiece, America in a year burns up the value of 30,000 airplanes, and 30,000 airplanes would win the war; or, to put it in another way, the nation's fire bill, if it could be applied to their construction, would supply our navy with one hundred and fifty destroyers, and such an added force would end the menace of the submarines.

The two billion dollar Liberty Loan carries an annual interest charge of \$70,000,000, but the United States burns up each year enough property to pay interest upon more than three Liberty Loans.

In destitution in the bereaved homes of France are multitudes of the children of those who have given their lives upon the battle field. Appeals have been made to American benevolence upon the basis of ten cents per day per child to provide for their immediate necessities. Six million such little ones, or far more than the total number in need, could be supported for the cost of our senseless destruction.

An investment of \$60,000 will equip a base hospital, capable of caring for 500 sick or wounded; if American people would change their habits to those of carefulness, 3600 such hospitals might be supplied by means of the money thus saved from fire destruction. This would approximate one to each half-mile on all European battle fronts.

From whatever standpoint it is examined, therefore, it must be realized that every preventable fire, little or big, is to some degree "an aid and comfort to the enemy." This is a matter of individual responsibility. Each one must take it to himself as a personal matter. There are fifteen hundred fires each day, or more than one per minute. What right has anyone to assume that all of these will occur upon the premises of "other people?" Unless he resolve this day that there shall be no such occurrence in property controlled by him, and unless he make this resolve effective by means of an immediate inspection and correction of all fire hazards, he cannot be considered a true patriot no matter what may be his professions.

AMERICAN COMMERCIAL EXPERTS IN FAR EAST

Paul Page Whithan is investigating ports, shipping, railways and other transportation facilities in the Far East and Russia. Mr. Whithan, a consulting engineer, has been identified with important port, railway and industrial engineering development during the past 12 years. He arrived in Shanghai the first of May and is making this city his headquarters for the China work, which it is expected will take over a year, much of the time being spent in travel.

J. Morgan Clemments is investigating mines and mining in the Far East. Mr. Clemments, mining engineer of New York, has had an extended experience in the United States. He arrived in Japan about six weeks ago, where he is now at work. Later he will cover Korea and China.

C. E. Bosworth is investigating markets for boots and shoes in the Far East. Mr. Bosworth is a man of wide practical experience in the shoe industry and trade. He should arrive in Shanghai shortly, having first visited Australia.

SPARKS—Current Facts, Figures and Fancy

(The gist of new applications of engineering in general and electricity in particular, are here gathered for the convenience of the busy reader. Light from the four quarters of the globe is thus available concentrated for possible use in solving your special problems.—The Editor.)

During the year ending June 30, 1917, 1876 ships passed through the Panama Canal as compared with 787 in 1916 and 1088 in 1915. The cargo carried aggregated 7,299,225 tons.

* * *

Electric fans for drying fruits and vegetables are recommended by the U. S. Department of Agriculture. The color is better and spoilage less in using this method as the product is kept cool by evaporation while drying.

* * *

The U. S. Bureau of Standards is working on a circular giving information on street lighting. Measurements have been made on two types of arc lamps to determine the distribution of light and the variation of candlepower and efficiency with current.

* * *

English women perform from 60 to 80 per cent of the machine work on shells, fuses and trench warfare supplies. They have been trained in aeroplane manufacture, in gun work and almost every other branch of manufacture, more than sixty technical schools and colleges being used for training purposes by the Ministry of Munitions.

* * *

The high cost of kerosene is stimulating the use of electricity for lighting in China. The rates at Foochow are 28 cents (Mex.) per kw.-hr., with an additional monthly charge of \$1.50 (Mex.) for meter charge. Two-thirds of the 36,000 lamps in use in this Chinese city are on a flat rate of \$1.00 (Mex.) per lamp per month. A 1000 kw. steam turbine has just been installed.

* * *

The Underwriters Laboratories are greatly interested and wish to secure information regarding some lines of electrical fittings manufactured in Japan, including sockets, snap switches and rosettes that within the past few months have been placed on the market in certain parts of the United States and Canada. The laboratories would like to know regarding the experience of those handling the goods mentioned.

* * *

Electric stimulation of plant growth offers attractive possibilities to increasing the crop production of Western farmers. The electro-culture apparatus developed by Sir Oliver Lodge in England is similar in many respects to that used in the Cottrell process for the electrical precipitation of smelter fumes. A method of small galvanized steel wire spaced at 30 ft. intervals is suspended at an average height of 15 ft. over the area to be electrified. Direct current is intermittently supplied at 120,000 volts. Practical experiments have demonstrated a 49 per cent increase in grain production and 25 per cent in vegetables.

"One important thing that war has accomplished is to prove that electricity will do man's work better, more quickly and at less expense than any other way." Likewise with woman's work.

* * *

The California Land Settlement Board is making rapid progress in its plans. The Board is ready to purchase from 4000 to 6000 acres of farm land and will improve, sub-divide and settle it. The land will then be sold for a small initial payment with 20 to 36 years to pay the balance, the purpose being to establish colonies of independent farmers. The system has been successful in twenty other countries, but is being tried here in America for the first time. Prof. Elwood Mead, University of California, Berkeley, is chairman of the board.

* * *

Colonel Harvey, in the North American Review, under the caption, "When Peace Comes, What?" gives a new angle to the government and municipal ownership idea. "There can scarcely be a greater delusion than that government ownership and operation of industries and utilities is the only alternative to monopolies and offensive trusts. It is as unreasonable and as unfounded as to say that anarchy is the only alternative to despotism. The essential spirit of democracy requires for the individual a free initiative in industry just as much as in politics. The citizen must be as free to work or to trade as he is to vote. Moreover, there must be similar freedom of combination; and as citizens are free to combine themselves into political parties, in order to exert an influence and to accomplish ends which would be beyond their reach if acting individually, so they must be free to combine in business corporations, in order to effect results which would be impossible to individuals. That is democracy."

* * *

The Nitrate Supply Committee, appointed by the Secretary of War, has decided to build a plant employing the synthetic ammonia process of the General Chemical Company. The exact location is withheld, but will probably be in the vicinity of southwest Virginia. The ammonia will be oxidized to nitric acid, the daily capacity of the plant to be equivalent to 24,000 lb. of 100 per cent nitric acid in a 24 hour day. Experiments are also authorized on the Bucher process for the production of sodium cyanide and ammonia. The building of by-product coke ovens is also to be encouraged, but "the decision as to more extensive installation of nitrogen fixation processes and water power development in connection with them is postponed until the plants above recommended are in operation or until further need arises."

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CONTENTS

Spokane's Steam Heating System.....	293
The Engineering Council. <i>By Ira N. Hollis</i>	297
The Triumph of Electricity.....	298
A New Use for the Electric Fan.....	298
New Electrical Uses in the Recovery of Rare Metals.....	298
Hydroelectric Energy as a Conserver of Oil.....	299
New Chart on Resuscitation.....	301
Extension of Stovanger Electro-steel Works.....	301
The Marvel of the Telephone. <i>By J. F. Greenawalt</i>	302
Obsolescence as an Element Affecting Rates. <i>By C. E. Grunsky</i>	307
New Advances in Water Right Adjudication. <i>By A. E. Chandler</i>	309
Electro-Culture.....	310
A Typical Instance of Underground Water Supply.....	310
Handling Repair Part Orders, Notes on Current and Potential Transformers, and Replacing 6-Lead Single-Phase Stations. <i>By George A. Schneider</i>	312
How to Compute Strength of Boiler Shells in Fuel Oil Practice. <i>By Robert Sibley and Chas. H. Delany</i>	313
Activities of Pacific Coast Section, N. E. L. A.....	316
Conventions of Electrical Men in the Northwest.....	318
The Washington Association of Electrical Contractors and Dealers.....	321
The Oregon Association of Electrical Contractors & Dealers.....	322
The Utah Society of Electrical Contractors.....	323
Germany's American Ally.....	324
Sparks—Current Facts, Figures and Fancy.....	325
Editorials.....	326
Personals.....	329
Meeting Notices for Electrical Men.....	331
Builders of the West—John D. Galloway.....	331
California Circulating Educational Exhibit.....	335
Trade Notes.....	336
New Books and Bulletins for Engineers.....	337
What Western Inventors are Doing.....	338
New Developments.....	339



THE SLACKER

"I'm not supposed to do that," said he,
 When an extra task he chanced to see;
 "That's not my job, and it's not my care,
 So I'll pass it by and leave it there."
 And the boss who gave him his weekly pay
 Lost more than his wages on him that day.
 "I'm not supposed to do that," he said;
 "That duty belongs to Jim or Fred."
 So a little task that was in his way,
 That he could have handled without delay,
 Was left unfinished; the way was paved
 For a heavy loss that he could have saved.
 And time went on and he kept his place,
 But he never altered his easy pace,
 And folks remarked on how well he knew
 The lines of task he was hired to do;
 For never once was he known to turn
 His hand to things not of his concern.
 But there, in his foolish rut, he stayed
 And for all he did he was fairly paid,
 But he never was worth a dollar more
 Than he got for his toil when the week was o'er;
 For he knew too well when his work was through,
 And he'd done all he was hired to do.
 If you want to grow in this world, young man,
 You must do every day all the work you can,
 If you find a task, though it's not your bit,
 And it should be done, take care of it;
 And you'll never conquer or rise if you
 Do only the things you're supposed to do.

—Edgar A. Guest, Detroit Free Press.



The Journal of Electricity entered into the promotion of the September electrical conventions throughout the West because its policy is sworn to the upbuilding of everything that is good and wholesome in affairs electrical in this promising section of our country and in the countries bordering the great Pacific.

Appreciative Thanks

To this end the September fifteenth issue was devoted almost exclusively to the papers and discussions of the Northwest Electric Light & Power Association. In addition to this, a Service Issue containing twenty pages of convention happenings and personal items was published during the convention week at Spokane. To have had the inner realization that the Journal of Electricity had been a small factor in contributing to the marked success of the beautiful Spokane convention would have been in itself sufficient reward for the effort and expense involved.

It is hence with profound and deepest appreciation that acknowledgment is here made of the wonderful reception that was given to this effort by the convention delegates and guests. The calling off of the convention proceedings by the chairman in order to urge upon the hosts assembled the cordial support of the Journal of Electricity and its undertakings, the formal resolution from the Executive Committee, the expression of thanks by resolution from the floor of the convention, and finally the beautiful words of introduction of a representative of the Journal of Electricity at the joint banquet by the toastmaster in the closing hours of the convention, will long be cherished and will serve to spur its editorial and managerial staff to keener endeavor.

The early putting in of the small hydroelectric unit of the Pacific Gas & Electric Company near the great Spaulding Dam, is interesting to engineers generally in that a variable head is made use of.

New Records in Water Wheel Design

This installation also contrasts strongly with the Wise plant of the company, which was thrown into service last spring, in that the Wise plant has a penstock piping over a mile and a half in length, while this new plant may be said to possess practically no length of penstock piping at all, since the water is taken directly from the pressure tunnel feeding from the dam above.

The varying heights of storage possessed by the Spaulding Lake reservoir will have as a consequence an unusual control over the available head for power generation. This fact has been allowed for in the design of the units involved and their successful operation will be watched with considerable interest by engineers generally.

At the White River plant of the Puget Sound Traction, Light & Power Company some miles south of Seattle, a new world's record in water wheel capacity is about to be established. Some years ago there was installed at this plant a water wheel unit of 18,000 h.p. capacity which at that time was known to be the largest in existence.

Later the Washington Water Power Company's installation at Long Lake, some thirty miles west of Spokane, eclipsed this record by the installation of a unit of 22,500 h.p. capacity. The new unit at White River, designed for 23,000 h.p., will again bring back the record to the vicinity of Seattle.

But the main source of gratification to engineers of the West, in following these installations comes from the fact that not only are records in size constantly surpassed in the West but increased efficiency in each succeeding unit is also to be noted.

Since the publication of a series of articles in the columns of the Journal of Electricity something over a year ago on the subject of iron as a conductor of electricity, by Clem A. Copeland, a host of inquiries have come to the editorial department of the Journal of Electricity from practically every section of the country on matters connected with this new departure in electrical transmission.

Due to the increasing cost of copper wire, iron as a conductor for even long distance transmission installation is bound to play an ever increasingly important part.

Not only has it found application in the wiring of homes and countless other uses in distribution throughout numerous sections of the West, but it will be interesting news to our readers to know that iron is now employed in long distance transmission of hydroelectric energy.

The new installation of the Montana Power Company from Thompson Falls, Montana, to the Coeur d'Alene mining district, some twenty-five miles in length, is accomplished entirely by lines of iron.

Recent tests on iron wire transmission are interesting. While very little difference in efficiency of transmission was noticeable, the poor regulation of iron was very obvious when the wire was used at high-current density. From a mechanical standpoint, however, the great strength of iron wire compared with copper enables the use of longer spans, hence the number of poles and towers required is greatly reduced.

Investigations of reactance phenomena and other characteristics of iron as compared with copper are now under way in this installation. Already the operation of the line has proven a success and the revision of formerly preconceived mathematical deductions seems inevitable.

Education is today recognized as the most powerful weapon in salesmanship. When the consumer is educated to the idea—in other words, when the idea itself is sold, the actual vending of the material ware becomes a simple matter.

The Power of Visual Instruction

There is daily growing upon the minds of thoughtful men the fact that in the past the flow of intelligence has too largely been transmitted through words while seldom has the power of visual instruction been made use of in modern salesmanship.

A recent achievement in visual instruction in the extension division of a university of the West is interesting. First it was proven that instruction from the printed page concerning matters pertaining to the electrical industry was not to be compared with matter that showed the processes of manufacture and use by means of pictures. Next it was found that instruction by pictures was not to be compared with instruction that exhibited the article itself. And finally, instruction in which the article is exhibited is not to be compared with an exhibit showing the step by step processes in manufacture and use.

Various manufacturers of electric ranges, telephones, vacuum cleaners and countless other pieces of electrical apparatus have been induced to donate these step by step exhibits and they are now being sent to all of the public schools that are interested and as a consequence remarkable results are being attained. Pictures of certain of these interesting exhibits are to be found on another page of this issue.

This recent unique advance in educational method has a wholesome lesson for the electrical industry throughout the West. Increased attention to the psychology of the show window means a study of visual instruction for the electrical contractor and dealer. The making of simple models showing the operation of the electric meter by the central station would help greatly to clarify the befogged mind of the housewife. Indeed, looking about us, it is easy to see countless new applications for the transmission of intelligence through visual instruction.

Increased study of this method of instruction is well worth the effort in our campaigns to sell the electrical idea.

Iron as a Conductor of Electricity

The Journal of Electricity has long advocated through its editorial columns, the thorough dissemination of all propaganda leading to the "Safety First" ideal in the construction and maintenance of the great engineering accomplishments of the West. To this end editorial comment has been set forth time and again favoring the establishment of industrial accident commissions and calling upon the Bureau of Standards at Washington to take the lead in formulating reasonable and far-reaching standards of construction that would insure safety to the workman and protection to life and property of the public generally.

It would seem in these later days, however, that in some instances the well-desired ideal of "safety first" is being perverted into the slogan of "safety mad."

It must be recognized that there is a human limit to which expense and design can be carried to prevent the infinite and remote possibilities of accident. Such recognition is necessary in the drafting of the proposed rules of safety now under discussion by the Bureau of Standards or they must fail of their real purpose.

Sane, reasonable demands in construction and operation in which the higher motives and ideals of all concerned—the engineer, the employer, the laborer, the general public—are drawn into play, can alone bring about the desired result—namely the prevention of accident.

That accidents can not wholly be prevented, even in the best regulated family, has been forcefully brought home to men in the West during the past two-week period. Hiram Conibear, the well-beloved and widely known athletic coach at the University of Washington, was known for his prowess in athletic strength and caution in habits of life. Yet the climbing out on a fruit tree only a few feet above ground, to gather fruit for breakfast, caused his fall and consequent instant death by fracture of his neck. The instance has from its very homely occurrence and apparently impossibility of prevention shocked the entire younger generation of the West.

Accident commissions may argue that even strong, husky athletes should not climb fruit trees or that ten thousand dollars should be spent on each orchard in installation of props to prevent falling from fruit tree limbs, but the fact remains that accidents of this nature can scarcely be avoided.

And so in all branches of industry ideas of safety must be promulgated in such a manner as to be sane

and within the possibility of reasonable occurrence. It is to be hoped that the undercurrent of protest now inwardly felt among men of industry and engineering endeavor may be at an early date lessened by somewhat more reasonable and sane demands from accident commissions and other bodies of similar nature.

The hearings of the electro-metals case before the California Railroad Commission have already received editorial comment in the columns of the Journal of Electricity.

Rates for Electro-Metals Installations

It will be illuminating as well as interesting to hear of an electro-metals institution in the middle west that has now been operating at a comfortable profit for over a year and the power rate under which service is rendered by a large hydroelectric institution generating power from the waters of the Mississippi River.

The load called for by this installation is now about 7500 kw., the power factor is 94 per cent or better and the load factor is just under 90 per cent.

The rate granted is on the basis of a .75c per month standby charge for each kw. of demand. In addition a ½c per kw.-hr. excess charge is made for energy consumed. In consideration of this low rate the electro metals company agrees to discontinue its demand at any time it is notified by the power company by a 48 hour warning. Or should the electro-metals company desire to avoid the possibility of this interruption it is to pay 6/10c per kw. excess charge. The demand is determined by taking into account the highest peak load of the month and integrating over a 30 minute period.

The electro-metals company is situated within 2½ miles of the power plant.

The hearing of the electro metals case in California has received marked attention from all quarters. On the one hand, the possible encouragement of new power load is to be achieved by the granting of a low rate, while on the other hand, the demand for power on all sides by other industries already occupying the field would perhaps justify a reasonably higher rate being put into effect.

In view of the fact that the rate just mentioned, which by the way is of record with the Illinois regulatory body, is a higher one than that offered by the power companies of California before the recent hearing in San Francisco and in view of the fact that the electro-metals company involved is itself operating at a profit, it would seem that this instance should prove of unusual interest in the discussion of the economic question involved.

THE NEW JOURNAL SERVICE: Journal service consists in anticipating the reader's wants. The better the publisher's judgment as to what will please the reader, the more successful will be the journal. Our growing list of subscribers is tangible evidence that the service rendered by the Journal of Electricity is appreciated. But in order to increase and improve this service more rapidly our list of subscribers should grow faster. To stimulate this growth we plan to start a subscription contest, full details of which will be announced in the next issue. As a reward for the securing of new subscribers fifteen prizes are to be given, including an automobile, a cabinet type phonograph and liberal cash prizes. Service is like a telephone instrument in that it should be equipped with a transmitter as well as a receiver. No one can consistently take without giving. So we ask our subscribers to solicit their friends to partake of the benefits of Journal service. Thus you can help them, help us and help yourself.

PERSONALS

S. Waldo Coleman, general manager of the Coast Counties Gas & Electric Company, was a recent host to the employes and officials in the five towns served by his company—San Francisco, Gilroy, Hollister, Watsonville, and Santa Cruz. The close ties engendered between employer and employe at these annual beach gatherings at Santa Cruz is responsible in a large measure for the excellent esprit de corps maintained throughout the organization of this utility company.



W. S. Berry, Pacific Coast sales manager Western Electric Company, is at New York City.

Harry F. Hartzell secretary of the Baker-Joslyn Company, is visiting the firm's Seattle office.

E. M. Cutting, Pacific Coast manager Edison Storage Battery Company, is making an extended Eastern trip.

Clifton Peters has been appointed assistant secretary of the Southern California Edison Company at Los Angeles.

S. M. Kennedy, general agent Southern California Edison Company, is spending his vacation at Lake Tahoe, California.

L. E. Sperry, representative New York Insulated Wire & Cable Company, at San Francisco, is visiting Portland, Seattle and Spokane.

A. E. Morphy, secretary Southern California Edison Company of Los Angeles, is in the officers' training camp at the San Francisco Presidio.

J. C. Manchester has severed his connection with the Interstate Novelty Company. **R. Wolf** has been appointed to succeed Mr. Manchester.

B. E. Hannon has resigned as manager of the Sacramento division of the Great Western Power Company to enlist in the Signal Reserve Corps.

C. Jones, electrical engineer of the transformer department of the General Electric Company at Schenectady is a recent San Francisco visitor.

Albert F. Menzel, assistant superintendent in charge of the Las Plumas plant of the Great Western Power Company, is a recent San Francisco visitor.

J. G. Monahan, Los Angeles, manager Edison Storage Battery Company and Sangamo Electric Company, was at San Francisco during the past week.

M. S. Orrick has been appointed assistant sales manager of the Western Electric Company in entire charge of the business of the San Francisco district.

R. J. Clavenger, of the Phoenix Glass Company of New York City, is making his annual trip to the Pacific Coast cities and recently passed through San Francisco on his way to Portland.

L. J. Moore, formerly chief load dispatcher San Joaquin Light & Power Corporation, Fresno, Cal., has succeeded **A. S. Kalenborn**, resigned, as electrical engineer for the company.

Claude C. Brown, formerly in the steam department of the Pacific Gas & Electric Company, is now power engineer for the Hawaiian Sugar Refinery Company at Crockett, California, in charge of steam and electric operation and construction.

William Kent, the author of Kent's Mechanical Engineers' Pocket Book, is a San Francisco visitor and was the guest of honor at a recent banquet at the San Francisco Engineer's Club.

J. D. A. Cross, in charge of heating appliance sales for the General Electric Co., took an important part in the electric range discussion at the Spokane convention of the Northwest Electric Light & Power Association.

D. D. Clarke, water engineer at Portland and builder of the fourteen million dollar water system for that city, has resigned. **F. M. Randlett** has been appointed water engineer and **Ben Morrow**, principal assistant water engineer.

B. C. Condit, formerly chief engineer with the Northwestern Electric Company at Portland, is supervising the electrical construction and equipment of the Crown-Willamette Paper Company's pulp and paper plant on the British Columbia Coast.

G. B. Muldaur, field secretary, National Electric Light Association, has returned to New York City after visiting Pacific Coast power centers and representing the association at the convention of the N. W. Electric Light & Power Association.

A. S. Kalenborn has resigned as electrical engineer for the San Joaquin Light & Power Corporation to accept a position as electrical engineer and superintendent of power for the Cerro de Pasco Mining Company at Cerro de Pasco, via Lima, Peru.

J. W. Metcalf, superintendent for the Southern Pacific lines, has actively taken hold of the fuel oil problem by appointing a number of engineers and firemen in his staff to assist in promoting an economical use of fuel oil on all lines under his control.

Capt. W. D. Peaslee, formerly connected with the department of electrical engineering at the Oregon Agricultural College and a well-known consulting engineer of Portland,



Oregon, has been assigned to the 316th Regiment of Engineers and is now stationed at American Lake. At present he is Battalion Adjutant and Regimental Exchange Officer. The best wishes of the engineering fraternity in the West go with Capt. Peaslee, in his splendid patriotic endeavors.

W. J. Grambs, assistant to the president, and **George Quinan**, chief engineer of the Puget Sound Traction, Light & Power Company, were among the prominent delegates to the Northwest Electric Light & Power Association convention from Western Washington.

G. B. Sanford has assumed the position of district manager for the Great Western Power Company, at Sacramento, Cal., succeeding **Boyd Hammon**, who has joined the U. S. Signal Corps. Mr. Sanford held a similar position with the power company at Rio Vista.

Paul V. Quick, of Landers, Frary & Clark, has returned to San Francisco after an interesting Eastern trip to his home office, the manufacturers of the "Universal" electric iron in Connecticut. On his return to the West Mr. Quick visited all of the large cities in the Northwest.

Lewis A. McArthur, general manager of the Pacific Power & Light Company, after delivering an excellent paper on salesmanship before the convention of the Northwest Electric Light & Power Association, was forced to return home before the close of the sessions, due to the illness of his wife.

E. W. Lindquist, formerly sales engineer with the mining machinery department of Allis-Chalmers Manufacturing Company, at Chicago, has been appointed the company's Pacific Coast manager to succeed **Fred L. Webster**, who was recently made manager of the Chicago territory.

Ira N. Hollis, president of Worcester Polytechnic Institute and president of the American Society of Mechanical Engineers, expects to visit the Pacific Coast during the latter part of October. The local sections of the four national engineering societies are planning a joint meeting in his honor.

Samuel S. Jaggard of Morrison Electric Company, Portland, and **J. R. Tomlinson** of Pierce-Tomlinson Electric Company, Portland, have been nominated as delegates to the National Contractors Convention, to be held at New Orleans this month. The election is being conducted by the members through the mail.

L. J. Corbett, head of the department of electrical engineering at the University of Idaho, who has been busily engaged in shipbuilding at Seattle during the past several months, for the government emergency fleet, attended the Spokane convention of the Northwest Electric Light & Power Association before returning to Moscow.

Edmund D. Walker, of the British Columbia Electric Railway Company, was an interested attendant at the Spokane convention of the Northwest Electric Light & Power Association. As the official representative to the convention from British Columbia, his presence added a distinctly friendly international flavor to its proceedings.

G. E. McFarland, president of the Pacific Telephone & Telegraph Company, and **J. C. Nowell**, general manager, were in Portland recently for a few hours, en route to American Lake, where they visited Camp Lewis and inspected the elaborate telephone exchange that is being installed at the cantonment. The telephone officials have their headquarters at San Francisco.

F. H. Lane, manager of the department of examinations and reports of H. M. Byllesby & Company, will have temporary charge of the engineering and construction department, succeeding **W. R. Thompson**, now captain in the U. S. Army, located at Battle Creek, Mich., and **A. H. Sayce**, who has joined the second Officers' Reserve Camp and left for Fort Sheridan.

S. M. Kennedy of the Southern California Edison Company, and wife; **E. H. Richardson**, of the Hotpoint Electric Heating Company, and wife and daughter; **Miles Steele**, of the Benjamin Electric Manufacturing Company; **Frank Fagan** and **R. M. Alvord** of the General Electric Company, were among

the California representatives at the recent Spokane convention of the Northwest Electric Light & Power Association.

C. S. MacCalla, general manager of the Washington Water Power Company, won the hearts and admiration of all delegates to the Spokane convention of the Northwest Electric Light & Power Association by the masterly manner in which his organization acted as the host for the convention gathering. And in this praise that is heard on all sides a generous share is given to Mrs. MacCalla for her gracious effort in the entertainment of the lady guests.

T. E. Bibbins, president Pacific States Electric Company, headquarters San Francisco, spent a few days at the Seattle office of the company on his return from the convention of the Northwest Electric Light & Power Association and the convention of the Washington Association of Electrical Contractors and Dealers. **H. R. Noack**, in charge of the insulator and pole line hardware sales of the company, also recently spent a few days at the Seattle office on his way back to San Francisco from the conventions.

W. R. Putnam, of the Utah Light & Power Company, threw a new element into the art of appliance salesmanship when he brought out the influence of the "kiddies," and their proper attention, when outlining a campaign for the method electrical at the recent convention of the Northwest Electric Light & Power Association. Mr. Putnam is now home again in Salt Lake City and is busily engaged in boosting the new organization of the Utah Society of Electrical Contractors and Dealers, which is to be formed the first week in October.

F. H. Poss, formerly sales and advertising manager in the central district for the Benjamin Electric Manufacturing Company, has resigned his position and has returned to San Francisco, his former home. He will take up distribution of Avery tractors in the West. **G. B. Weber**, who has been associated with the sales force of the Chicago office for the past seven years, has been made sales manager, while **P. A. Powers**, connected for the past three years with the publicity department, has been made advertising manager of the company.

Chas. A. Sears, general superintendent of the Mississippi River Power Company of Keokuk, Iowa, which operates the largest hydroelectric installation in the world, is a recent visitor in the Northwest. In company with **J. E. Woodbridge** of the Sierra & San Francisco Power Company, **S. J. Lisberger** of the Pacific Gas & Electric Company, **Jos. D. Harrisburger** of the Puget Sound Traction, Light & Power Company, and **Robert Sibley**, editor of the Journal of Electricity, he made a recent visit to the White River plant near Seattle, where the largest water turbines ever built are now being installed and are soon to be put in operation.

J. E. Woodbridge, Sierra & San Francisco Power Company, San Francisco, and the official representative of the Pacific Coast Section N. E. L. A.; **S. J. Lisberger**, Pacific Gas & Electric Company, San Francisco; **T. E. Bibbins**, Pacific States Electric Company, San Francisco; **W. F. Garby**, Automatic Electric Faucet Company, San Francisco; **W. S. Berry**, Western Electric Company, San Francisco; **Garnett Young**, Telephone Electric Equipment Company, San Francisco; **W. C. Wurfel**, Westinghouse Lamp Company, San Francisco; **J. A. Vandegrift**, National Lamp Works, Oakland; **H. R. Noack**, Pacific States Electric Co., San Francisco; **Joe Thompson**, Pacific Electric-Manufacturing Company, San Francisco; **W. M. Deming**, business manager Journal of Electricity, San Francisco; and **Robert Sibley**, editor Journal of Electricity, and wife, San Francisco, journeyed from San Francisco to Spokane in a special car to attend the recent Spokane convention of the Northwest Electric Light & Power Association.

MEETING NOTICES FOR ELECTRICAL MEN

(September has proven the banner month of the year for the electrical conventions in the West. On other pages of this issue will be found accounts of the conventions of the Northwest Electric Light & Power Association, the Washington Association of Electrical Contractors & Dealers, the Oregon Association of Contractors & Dealers, and the Utah Society of Electrical Contractors. On this page will be found notices of other meetings of current interest to Engineers throughout the West.—The Editor.)

Joint Meeting of San Francisco Engineering Societies

A joint meeting of the local sections of the American Society of Mechanical Engineers, American Society of Civil Engineers, American Institute of Mining Engineers, American Institute of Electrical Engineers, and American Chemical Society, will be held Thursday, October 25, 1917, at 6:30 p. m., in honor of Dr. Ira N. Hollis, president of the American Society of Mechanical Engineers. An informal dinner will be served, followed by a short talk by a representative of each of the societies on the relation of engineering to the war, and an address by Dr. Hollis on "The Moral Influence of Engineering and Efficiency." The exact location and further details will be announced later. This preliminary announcement is for the purpose of insuring that all engineers will keep the date open.

The Oregon Society of Engineers

The regular meeting of the Oregon Society of Engineers was held in Portland, Oregon, Thursday, Sept. 20, 1917.

Mr. Franklin T. Griffith, president Portland Railway, Light & Power Company, gave a talk on the need of his company for increased transportation revenue. The Society did not go on record as favoring or opposing the increase. As a quorum was not present no business could be transacted.

San Francisco Section A.I.E.E.

Interesting and profitable programs are being prepared for the fall meetings of the San Francisco Section A. I. E. E.

The September meeting of the American Institute of Electrical Engineers is to be held on Friday, September 28th, at 7 p. m., in the room of the Engineers' Club, Mechanics' Institute Building, San Francisco.

As these forms go to press it is announced that J. D. Galloway, chairman of the Committee on Engineering and Inventions of the State Council of Defense, is to speak on the subject of "The Civilian Engineer and the War," and Mr. Frank Rieber of the Rieber Laboratories will speak on the subject of "Engineering Problems of the War." Members of the four national engineering societies have been cordially invited to attend this meeting.

San Francisco Electrical Development & Jovian League

At the meeting of September 12th, Rod G. Guyett, as chairman of the day introduced Milton D. Clark, chief architect of the San Francisco Board of Public Works. Mr. Clark emphasized the pressing needs for additional school facilities in the city and briefly described the plans for new construc-

tion. These plans call for the expenditure of \$3,500,000 which is to be raised by a proposed bond issue.

On September 19th, Dr. Ng. Pow Chew, editor of Chung Sai Yat Po, was introduced by Milo Hickox. In a most interesting manner Dr. Chew traced the events of the past twenty years which culminated in China's entrance into the present war. He also explained the reasons why China is essentially republican in government and prophesied the stability

of the new republic. With regard to what China can do for the allies, he stated that 250,000 Chinese farmers and laborers had already gone to work in France, and more are to follow. There are millions of able bodied men available as soldiers. She also has ten arsenals, four of which are thoroughly up-to-date and in addition has a great abundance of coals, iron and other raw materials. All that is needed is money with which to equip, maintain and transport troops.

September 26th proved to be a most interesting meeting in that W. Hatch, secretary of the Bureau of Visual Instruction, extension division of the University of California, gave an interesting talk on electrical exhibits that have been donated by various manufacturers and are now being sent to various public schools of the state. Pictures of these exhibits are to be found on another page of this issue. The speaker was fittingly introduced by F. M. Boyd of the General Electric Company.

L. H. Newbert, C. E. Heise, D. E. Harris, C. B. Kenney and

Robert Sibley have been appointed a nominating committee to select candidates for officers of the League for the new year commencing in October, 1917, the first named being chairman.

The officers to be elected are president, vice-president, second vice-president, secretary-treasurer and two members of the executive committee. The hold-over members of the executive committee are Messrs. E. E. Brown and H. P. Pitts.

The quarterly session of the California Association of Electrical Contractors & Dealers is to take place at Fresno, California, October 15 and 16, 1917. A goodly representation is going down from San Francisco and the Los Angeles delegation is expected to be well representative of the industry from that quarter.

Pacific Coast Electrical Supply Jobbers' Association

The quarterly gathering of the Pacific Coast Electrical Supply Jobbers' Association is to take place at the beautiful

BUILDERS OF THE WEST—XIV.



JOHN D. GALLOWAY

The loyal response of engineers throughout the West to the country's call for national service has proven in full keeping with the splendid traditions of this section of the country. Not only have engineers of the West offered to give of their all in line service, but the effective aid contributed in expert advice for national and state defense and the enthusiasm shown in organizing local home guard organizations has been most marked. To Major John D. Galloway, the noted consulting engineer of San Francisco, this issue of the Journal of electricity is dedicated in appreciation of his excellent work for the United Engineering Council, the State Board of Defense, and the marked enthusiasm he has installed in others to offer their all for the service of the country.

Beverly Hills Hotel situated about half way between Los Angeles and Santa Monica, October 25, 26, 27, 1917. Even at this early date interest is being manifested from many quarters and a goodly attendance is anticipated.

ELECTRICAL CHRISTMAS GIFTS CAMPAIGN

An electrical appliance is one of the most practical gifts that can be made this Christmas. This is a year of stern reality—useful gifts will be the vogue.

With the view to concerted action in selling gifts electrical, the Society for Electrical Development will conduct a great nation-wide campaign this fall. It will take the place of "America's Electrical Week," which will not be held owing to war conditions.

The society will announce its big campaign in a broadside to be mailed to the industry on October 10th. Every central station, and practically all contractor-dealers will be reached, fully 25,000 businesses. A tremendous effort will be made to have the industry present a solid front in merchandising its wares to the Christmas trade.

Following the broadside announcement, about November 1st, an illustrated "how to" booklet will be mailed giving concrete suggestions for selling appliances and how the reader can tie into the great national drive. Members and non-members of the society will be offered attractively designed window lithographs, window cards, window transparencies, poster stamps, etc., without cost. The official design is now being prepared by one of America's great poster artists. It will embody the Christmas spirit—a picture story of the slogan "Give Something Electrical This Christmas."

Soon after this "how to" booklet is mailed, the society will send a portfolio of advertising suggestions for newspaper ads, mailing cards, folders, etc., which can be used by all local electrical interests in backing up their display material.

The campaign is not intended to be as big as either "Electrical Prosperity Week," 1915, or "America's Electrical Week," 1916. It will, however, be a real selling campaign from start to finish. Millions of dollars will be spent for Christmas gifts, mostly useful gifts, during the holiday sales period, November 15 to December 24. The electrical industry has never gotten its share of this business. This campaign will provide the opportunity. The Society is recognized as electrical campaign headquarters and it is to be expected that the big movement this year will have the same splendid co-operative service work that made the two big weeks in 1915 and 1916 so remarkably successful.

BUYING MADE SAFE AND EASY

Does the average person ever stop to think what a safe and easy thing buying has become in our day? What a contrast to the way it used to be within the memory of most of us.

This applies to all buying—of necessities, of luxuries, of everything.

Mr. John Sullivan, secretary of the Association of National Advertisers, in a recent interview said some things on this subject which should interest every buyer in the world. For his words apply to the purchase of anything, from a 5-cent cake of soap up to the most expensive advertised article.

"Today," said Mr. Sullivan, "the housewife sends her little child to make purchases at the corner grocery. She sends her with perfect confidence that, even though a child, she cannot err therein. All that the child needs is explicit instructions to buy THIS or THAT. In the case of all staple produce the price is known, the quality is known and the NAME is known. There is practically nothing about the goods that is unknown. And to be sure of getting exactly what you want, it is only necessary to name the goods."

APPLICATIONS FOR APPROPRIATION OF WATER

Applications for permission to appropriate water have been received by the California Water Commission as follows:

W. H. Metson of San Francisco, 100 cubic feet per second of waters of Grant Line Canal, tributary to the San Joaquin River in San Joaquin County for the irrigation of 1063 acres by means of an intake pipe 24 inches in diameter. The work of diverting the water has been completed at a cost of \$10,000.

A. F. Wohlfrom of Colusa, 20 cubic feet per second of waters of Sacramento River for the irrigation of 1266 acres within the Jimeno Rancho in that county. The proposed diversion works consist of a 20-inch centrifugal pump operated by a 75 h.p. motor and a main ditch four miles long. The estimated cost is \$11,000.

The Tisdale Irrigation & Drainage Company, a mutual water company, forty second feet of the Sacramento River near Grand Island P. O. in Sutter County for irrigation. Proposed diversion is to be made in two units. What is termed the upper unit consists of an 18 in. centrifugal pump and 75 h.p. gas engine, with 2½ miles of main ditch and the lower unit comprises a 12 in. pump and 40 h.p. engine and a mile of main ditch. The diversion waters 2696 acres and the work has been completed.

F. H. Osgood of Seattle, 125 cubic feet per second of waters of west branch of east fork and east branch of east fork of east fork of Illinois River for the operation of mines in Josephine County, Oregon, by means of a main ditch and flume five miles in length to cost \$35,000 and also 125 cubic feet per second of the waters of west fork of the east fork of the Illinois River, by means of a main ditch 9½ miles long to cost \$40,000, water also to be used at mines in Oregon.

Jesse B. Holly of San Francisco, 15 cubic feet per second of the regulated flow of Dog Creek, tributary to Truckee River in Sierra County for municipal supply of Reno, Nevada. The proposed works consist of a hydraulic fill storage dam, 110 ft. high, to hold back 23,000 acre feet and a supply pipe line 14 miles in length. The present population of Reno is given as 14,000 and the estimated future requirements of the city as 13,000,000 gallons per day. The estimated cost is placed at \$250,000.

HOTPOINT MISSION ART WINDOW DISPLAY

Typical of that section of the country from which comes the product of the Hotpoint Electric Heating Company of Ontario, California, is the unique mission art window display pictured here. The display is being furnished by the Hotpoint Company to its distributors in connection with its fall and winter campaign.

This window display is a three-panel screen three feet high and more than four feet wide. The frame is made of redwood obtained from the famous redwood forests of California. Two carloads of this wood were used in the production of these displays.

The center panel of the display accommodates a 14x21-in. card featuring catchy sales talks on the appliances illustrated in the attractive posters used in the side panels. Eight of these cards are furnished with each display. The name of the dealer is printed just below the selling talk. In the lower right hand corner of the card is shown a beautiful pen and ink sketch of one of the California Missions.

Sixteen attractive posters, lithographed in five colors, are furnished for use in the side panels of the display. Each one depicts the use of Hotpoint appliances in the home. Two of these posters are to be displayed at a time, thus affording eight changes for as many weeks.

With each display is also furnished a set of richly colored mats, harmonizing in color with the posters. These mats are to be used as a covering on the floor of the window, with a display of Hotpoint appliances placed thereon.

HAPPENINGS IN THE INDUSTRY

Threatened Telephone Strike at Portland

The Portland Union No. 125, of the International Brotherhood of Electrical Workers, comprising mainly linemen and inside electricians employed by the Pacific Telephone & Telegraph Company, have taken a secret ballot, similar to that taken in other Coast cities, on the questions of striking should the company not meet the demands for \$5 a day by October 21st. Officials of the local said after the ballot there was no doubt the vote was for a strike. Following the ballot the union adopted resolutions calling upon the Central Labor Council of Portland to request the public service commission to investigate the claims of the company that its revenues do not warrant it meeting the demands for increased wages, and if the claims are justified to authorize higher service rates.

Edison Sells to Pasadena

Adopting the identical plan by which the Los Angeles power controversy was settled between the city and the Southern California Edison Company, plans were announced recently by Engineer C. W. Koiner of the municipal lighting plant for the purchase by the city of Pasadena of the Edison system in Pasadena for approximately \$500,000.

Under the terms of the contract the Edison system is to be leased to the city for two years, after which the city will purchase it and, as a condition of the sale, will for thirty years purchase power from the Edison Company at wholesale. This plan will permit the use of hydroelectric power and will save the city the necessity of purchasing oil at the present high market for the manufacture of current.

Through the fact that Engineer Koiner was a special representative of the city of Los Angeles during the Los Angeles settlement, he gathered together without expense to the city of Pasadena the data necessary to draw the necessary agreement. In July Koiner was instructed by Commissioner Salisbury to prepare a final report for submission to the commissioners.

In his report made public recently Koiner points out that the settlement planned will remove more than 6000 duplicate poles from the city streets and will eliminate the waste due to competition that has been strangling the growth of the municipal plant. Koiner's report covers the following points:

Value of Edison distributing system in Pasadena, \$500,714.79, payable in cash at the end of two years' lease.

The city to agree to purchase power for a period of thirty years, the rates for same to be fixed now for the first ten years and revised every five years thereafter, or, in case of disagreement, to be fixed by the State Railroad Commission.

The Pasadena steam plant to be shut down and operated only as needed, or at the order of the Edison Company.

Pasadena to agree to confine itself to the distribution of electrical energy to the city and to agree to sell to the Edison Company its distributing system outside the city, with some exceptions.

Extensions to both systems during two-year-lease period to be made under contract.

As rental for the company's system Pasadena would pay to the Edison Company an amount equal to 8 per cent per annum on the agreed purchase price and 3.36 per cent per annum to be held by the city as depreciation reserve.

The Edison Company is to assume the unexpired term of lease on its office in Pasadena.

Mr. Koiner stated after the commission met that, in his opinion, this is a much better deal than any the city has ever been offered from the Los Angeles municipal light department, with which Pasadena has been negotiating for some time.

State Commission Can Fix Car Fare

The Public Service Commission of Oregon is vested with full powers to raise or lower street railway rates in the cities of the state, providing that after a full and complete hearing the facts justify such action. Attorney General Brown so advised the commission in an opinion recently.

The opinion was asked for by Commissioner Buchtel to determine to what extent the commission has power to pass upon the application of the Portland Railway, Light & Power Company for an increased fare on its street railway lines.

"It has been the opinion of this office ever since preparing and filing brief in the Supreme Court of Oregon in the Woodburn case, 82 Oregon 114, that the public service commission of this state is vested with the power either to raise or lower street car passenger rates of the various cities of the state, if, after a full and complete hearing, the facts justify such action," said the Attorney-General.

Endorsement of the Shield and Walsh Bills

The Shield and Walsh Bills for the encouragement of hydroelectric development were endorsed at a recent meeting of the chamber of commerce of Stockton, California.

The Walsh Bill deals with development of electric power in the public domains, where the United States is interested simply as a land owner, whereas the Shield Bill deals with the generation of electric current on navigable streams.

Utah Power & Light Company Offers Its Preferred Stock to Customers

In purchasing stock under the extended payment plan offered by the Utah Power & Light Company, the consumer is establishing a savings-investment account, which offers most attractive advantages in that the consumer receives interest on installments paid, at the rate of 6 per cent per annum from date of first payment until final payment is made, when consumer will have delivered to him a certificate for the number of shares purchased and then receive dividends quarterly at the rate of 7 per cent per annum. The adoption of this plan should encourage the savings and investments of small sums of money, which would not otherwise be saved.

During the limited period of the campaign the company is offering to pay to all employees commissions on sales made by employees as follows:

\$2.00 for each sale on partial payment plan of one, two, three or four shares;

\$3.00 for each sale on cash plan of one, two, three or four shares;

\$4.00 for each sale on partial payment plan of five or more shares;

\$5.00 for each sale on cash plan of five or more shares. On cash sales, your commission will be paid to you immediately payment is made to us by the purchaser. On partial payment sales, commission will be paid to you when the fourth installment is paid to us.

Four Cent Car Tickets Discontinued

The sale of 25 car tickets for \$1.00 has been discontinued by the Puget Sound Traction Light & Power Company in accordance with a decision of the public service commission dismissing the protest of the city of Seattle against the company's tariff supplement which provides for a straight five cent fare. The only exception to the flat rate is that of 2½ cents for school children during the school year which will be continued by order of the commission.

In the contention over the franchise tax on gross earnings the company suffered a legal reverse that will result in the city taking a judgment for \$64,387.78, the amount of two

per cent of its gross earnings for 1916. It is understood that an appeal will be taken.

In the matter of the four cent car tickets corporation counsel states that he will ask the Thurston County superior court.

Albany Company Secures 47 New Electric Range Customers

The Albany, Oregon, division of the Oregon Power Company has placed 47 electric ranges during a four months' campaign, and has prospects for a considerable number of additional sales. Contract has been secured with a saw mill adjacent to the company's 11,000 volt line between Corvallis and Philomath covering its electrical energy requirements amounting to 45 horsepower in motors.

Steam Cost May Rise

Application for an increase of approximately 20 per cent in steam heating rates has been filed with the public service commission by the Northwestern Electric Company. The company markets steam, for heating purposes, as a by-product for its electric service. Oil is used to generate the steam, which is metered to consumers. The company's distributing system is confined to the business district.

Technical Schools Appreciate Pacific Coast Section N.E.L.A.

As an instance of the deep appreciation of the Pacific Coast Section N. E. L. A. that is felt by the technical schools and colleges of the West, the stenographic report of the Riverside convention of the Pacific Coast Section, N. E. L. A., bears forceful record. Professor R. W. Sorenson of the electrical engineering department at Throop College of Technology, in closing his remarks in the engineering section discussion, had the following to say:

Prof. R. W. Sorenson: One of the statements which I made this morning was that as a designing engineer I discovered that the power company engineers did not know anything about how to design apparatus, because they always made us change it from the way he wanted to do it. I had in mind another thing that I hoped I would get a chance to say. Since coming to be a teacher and classing myself with those who teach rather than those who do, I have found out that the engineers of the power companies know something after all, particularly in my association with the Pacific Light & Power Corporation, as I spoke this morning. And if the engineers of all power companies can engineer as well as the chief engineer of that power company and his assistants, and the manager of that power company and his assistants can manage, I think I have a good deal more to learn. But the climax has been capped in this meeting. It is the first N. E. L. A. meeting that I have had a chance to attend, and I want to express these few words of appreciation of Throop College and other engineering colleges in general for the privilege which has been given the colleges in uniting not only with the section but with the national N. E. L. A. We have recently received circulars asking us to get in touch with the power companies to find out what we could do for the power companies. It looks to me as though the balance is on the other page and that probably the colleges are going to get more than the power companies. However, it is the policy of the institution which I represent today to do all we can for you. If there is opportunity to serve, we will do it in any capacity, in research lines or in any way in which we may help.

MISCELLANEOUS NEWS NOTES

SEATTLE, WASH.—R. H. Travers, Arcade building, has been awarded the contract for the municipal railway extension at \$19,554.43.

JEROME, IDAHO.—The Idaho Power Company is preparing to construct an 80-mile power line from here to Jarbidge, Nevada.

PETALUMA, CAL.—The Presto Electric Company, which a few months ago planned to erect a factory in the old foundry building, will now carry out their plans.

TRACY, CAL.—The directors of the West Side Irrigation District have awarded a contract to the General Electric & Machine Company of Stockton for completing power installation and furnishing seven complete pumping units, at about \$60,000.

SALT LAKE CITY, UTAH.—The Utah Power & Light Company is contemplating the construction of a large steam heating plant in Salt Lake City, to cost several hundred thousand dollars. The company already operates three steam plants in the city.

SAN FRANCISCO, CAL.—The Enterprise Electric Novelty Company of New York is opening Pacific Coast headquarters at 706 Sansome street in San Francisco. This company manufactures portable flashlights and batteries and is new on this coast.

SEATTLE, WASH.—Gray & Barash, electrical engineers and contractors, have been granted permits to erect a \$4000 warehouse, a \$15,000 machine shop and a \$1000 office building at 63 Horton street. Improvements are due to a great expansion in their business.

WHITE SALMON, WASH.—It is reported that plans are under way for construction of another large power plant on the White Salmon River by the Northwestern Electric Company between the present power house and Underwood, same to cost about \$400,000.

SEATTLE, WASH.—The contract for furnishing meters for the lighting department for the ensuing year were divided as follows: W. R. Hendry & Company, \$10,000; Northwestern Supply Company, \$10,000; Fobes Supply Company, \$7500, all local concerns.

HELLIX, ORE.—The town council has signed a contract with the Pacific Light & Power Company of Portland for lighting the city for a period of five years. The Helix Milling Company will install a 100 h.p. motor in its mill. A transmission line will be erected from Adams to Touchet, via Helix.

SEATTLE, WASH.—Sealed bids will be received by the board of public works up to October 5 at 10 o'clock a. m., room 231 County-City building for about 450 distribution transformers for the city lighting department for the ensuing year. Satisfactory surety bid bond or certified check for \$2000 payable to the order of the city comptroller, required with bid.

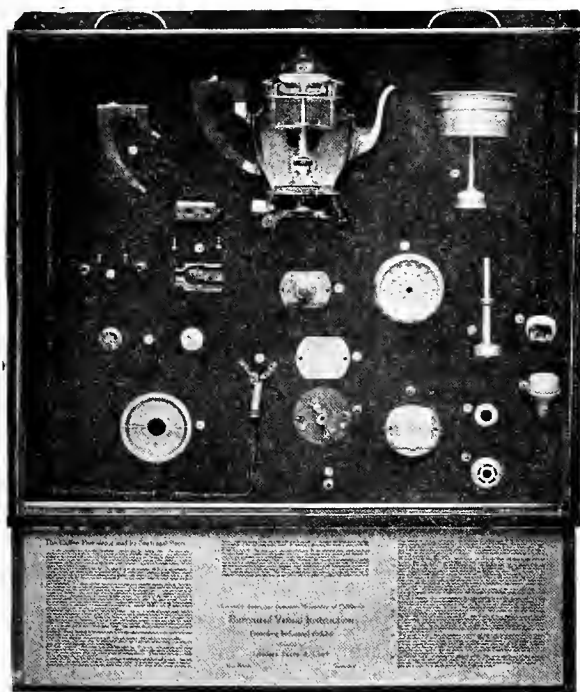
SUSANVILLE, CAL.—In an interview W. L. Wales, chief engineer of the Honey Lake Valley irrigation district, gives the following facts about the project, the completion of which means much to Lassen County: The district comprises 33,150 acres held in small ownerships except in a few instances. It is estimated that a canal of capacity sufficient to carry 390 cubic feet per second will be of ample size and water can be delivered to users by April or May, 1919, as all necessary data is now in the hands of the State Water Commission. It is planned to develop immediately enough water to supply the demands of water users for the next eight or ten years, with all construction and development done in such a way as to allow for completion of the entire project when necessary at a minimum cost. The total cost of the system necessary for the present and, in fact, for about ten years to come, is estimated at \$836,479, or \$25.20 per acre per year. The ultimate cost of completing the entire project is \$1,457,218, or \$43.95 an acre per year, which would be the final cost. Data of various projects of the United States reclamation service shows the mean yearly cost of operation to be 36 cents per acre. The report rendered on this district places the cost of operation at 50 cents per acre in order to allow for unforeseen contingents which may arise.

LATEST IN EVERYTHING ELECTRICAL

(Visual instruction has of recent years become a valuable tool for educating both young and old along technical lines. Physical laws and their practical application under proper appeal to the eye become easy of explanation. Below may be found an interesting description of a set of forceful exhibits that have been presented to the University of California by leading manufacturers of electrical ware. These exhibits are shipped under the direction of the University Extension Division to various schools and organizations throughout the state and are proving extremely valuable in disseminating knowledge along electrical lines.—The Editor.)

CALIFORNIA CIRCULATING EDUCATIONAL EXHIBIT

Several electrical concerns are co-operating with the Bureau of Visual Instruction of the Extension Division of the University of California in circulating educational exhibits throughout the public schools of the state. These exhibits are shipped from school to school as requested, each class being required to give definite study to each exhibit. The University has more than one hundred exhibits in its list as furnished to the schools. Requests for exhibits are scheduled so that a school receives only one exhibit at a time for two or three weeks.



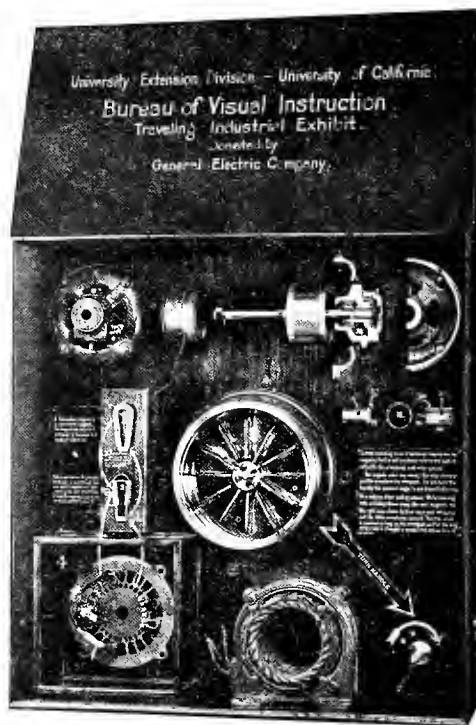
Landers, Frary & Clark Exhibit, illustrating the Electric Coffee Percolator

The electrical exhibits listed include storage batteries by the Edison Storage Battery Company; lamps, motors and ranges by the General Electric Company; irons and vacuum cleaners by the Hot Point Electric Heating Corporation; flash-lights by the Interstate Electric Novelty Company; percolators and irons by Landers Frary & Clark; the telephone by the Pacific Telephone & Telegraph Company, and the telegraph by the Western Union Telegraph Company.

Each exhibit consists of two sheet metal cases about 30 in. square by 9 in. deep. In one case is mounted the various sections of the device and in the other is a display rack for pictures showing how the device is made and used. Each exhibit is also accompanied by descriptive circulars which are given to the pupils by the teacher.

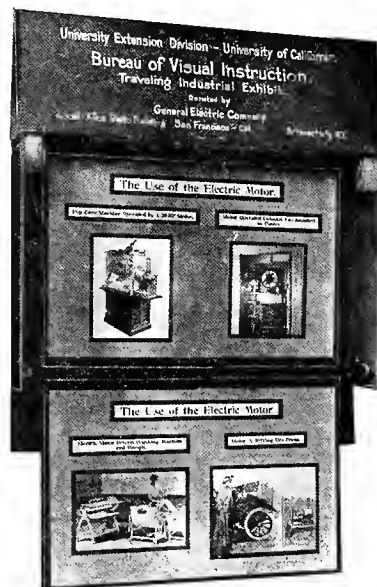
Accompanying illustrations show one of the General Electric Company's exhibits,—“the electric motor, what it is, what it does, how it works, how it is made.” One case shows a rotor, stator, bearings and pulley together with a permanent and an electro-magnet to illustrate the principle of the motor's action together with a working model of a motor. The other

case contains twenty panels carrying photographs which illustrate the manufacture and use of motors. These include the



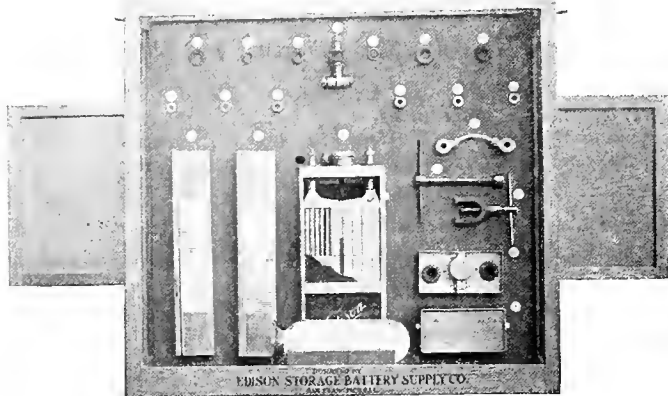
General Electric Exhibit of Electric Motor

making of molds, punching, assembling, winding, finishing and inspection, and applications to various industrial and domestic uses. Similar cases have been devised for the electric range and the electric lamp.



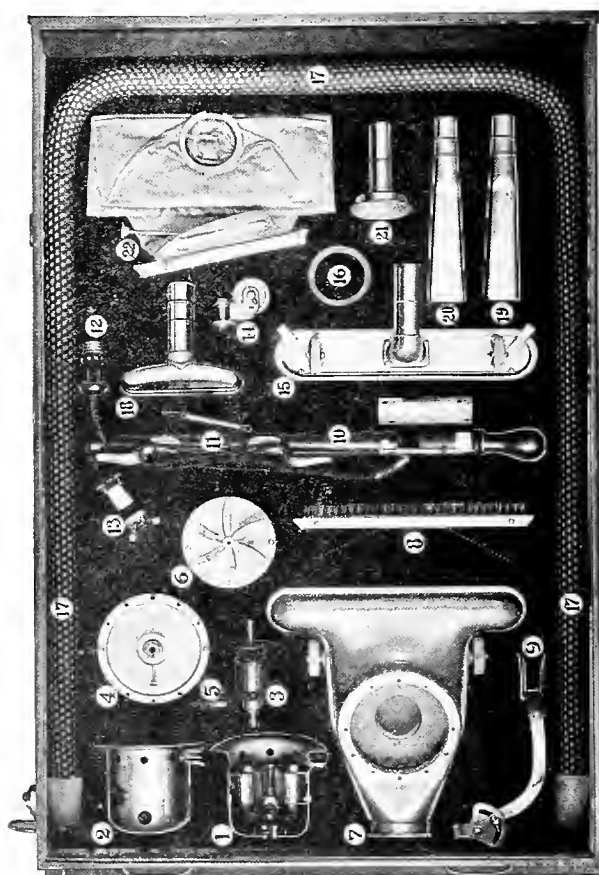
General Electric Exhibit of Manufacture and Use of Electric Motor

The Edison Storage Battery Company's display demonstrates the evolution of the battery from carbon steel ribbon to finished product. Samples of the carbon steel ribbon



Edison Storage Battery Company Exhibit

bank, the perforated strip, the nickel-plated, the appearance when pressed into halves, the assembly of the halves, and the loaded pocket, are shown for the negative element. Likewise for the positive tube. The method of mounting and form of container are shown in detail.



The Hotpoint Electric Heating Company's Exhibit of Vacuum Heaters

The Hotpoint vacuum cleaner exhibit shows the essential parts, manner of assembling and general operation. These include the exterior and interior of the motor casing, the armature, bearing plate, motor brush, fan, cleaner body, floor brush yoke, floor brush, switch-handle and attachments. All of these are explained in detail as to construction and operation in the literature accompanying the exhibit.

PICTURES OF FIGURES

A remarkably interesting pamphlet has just been published by the LaSalle Extension University of Chicago, on "Graphic Charts for the Business Man." It is the work of Stephen Gilman, C. P. A., vice-president of the Tanner-Gilman Company, public accountants.

The entire subject is only in its infancy, and it may reasonably be expected that the art will be developed very extensively within the next decade.

Besides a clear account of the whole process of graph making, this booklet contains 56 examples of graphs, from the simplest forms to highly elaborate charts. They include records of manufacturing costs, production, business organization, flow of materials, salaries of employees, net profits, relation of stock market to business activity, salesmen's productivity, sales, responses to advertisements, geographical distribution of customers, collections, relation of assets to liabilities, shipments, cash balances, time studies, idle time, traffic, bank deposits, complaints, telephone service, and many other things. These charts are so selected as to illustrate all the principal varieties of graphs in use at the present time.

The pamphlet has been prepared for use in the Business Administration Course of the LaSalle Extension University.

TRADE NOTES

The General Electric Company, Portland, has been awarded the contract for equipment to be installed on the Interstate bridge, made necessary through lack of sufficient current in present generating system to operate the lift span. The contract of the company amounts to \$5200 and the entire system will cost about \$7500.

Arrow Electric Company, 1627 Fourth avenue, Seattle, has closed a contract with the city for converting the present two wire trolley system on Division "A" of the municipal railway lines into a single wire system at a cost of about \$5500. The company has also closed a contract for electrical installations in the addition to the grain elevators for the Port of Seattle Commission, amounting to \$2240.

Fairbanks, Morse Company was awarded the contract for the major portion of the equipment, including gas engines, exciter sets and storage tanks at \$9380 for light plant to be installed by the city in Harlem, Mont. The Electric Construction Company of St. Paul was awarded the contract for pole line and switchboard, also commercial and street lighting circuits.

The Associated Engineering & Supply Company the manufacturers of the Mint System of Fuel Oil Control, has equipped the Santa Fe stationary plant at Richmond, the Santa Fe ferry boats "San Pedro" and "San Pablo," and the tugs "Richmond" and "Ripley." The tug "Payson" has been equipped for six months and as a result of the excellent showing of this tug the other equipment is being installed. A similar equipment at the Palace Hotel in San Francisco and Peet Bros.' Soap Works, at Berkeley, have also just been completed.

NePage, McKenny Company, Armour building, Seattle, electrical engineers and contractors, having offices at Seattle, Portland, San Francisco and Oakland, report contract for complete electrical equipment in ten 9400-ton steel steamships being constructed for the United States government by Moore & Scott, shipbuilders of San Francisco, the contract for this work being secured through the San Francisco office. They also reported that the Portland office has secured a contract for the electrical equipment in ten wooden ships being constructed at Portland by the Supple & Ballin Shipbuilding Corporation. They also have the contract for equipping practically all of these wooden vessels with electrical steering gear.

NEW BOOKS AND BULLETINS FOR ENGINEERS

The Electron

By Robt. A. Milliken, professor of physics, University of Chicago Press, Chicago, Ill., and for sale by Technical Book Shop, San Francisco. Price \$1.50.

The favorite introduction to electrical texts a decade ago was "we do not know what electricity is,—we can merely study its effects." But recently scientists have come perilously near to answering the question of the ultimate nature of electricity. Foremost among these has been the author of this little book whose classic experiments on the isolation and measurement of the electron has blazed a trail for those who follow. Herein he marshals a great array of evidence for the atomic structure of electricity, describes some of the electron's most significant properties, and their bearing on the structure of matter and the nature of electromagnetic relations. In so doing he traces the work of early investigations as well as those of the present day, including full details of his own experiments. He comes to the conclusion that an electric current "is the passage of a definite material, granular substance along the conductor," this substance being the electron. In other words it indicates that electricity and matter are merely different aspects of one and the same thing. The text will prove intensely interesting to even the layman and exceedingly valuable to the technical man.

Electrical Measurements

By Frank A. Laws, professor of electrical engineering, Massachusetts Institute of Technology and Harvard University; size 6 by 9 in.; 719 pp.; published by McGraw-Hill Book Co., New York City, and for sale by Technical Book Shop, San Francisco. Price \$5.00.

Lord Kelvin once wrote "when you can measure what you are speaking about and express it in numbers, you know something about it." Based on this criterion and judging from Prof. Laws' exhaustive account of how electricity is measured, a great deal is known about electricity. Instruments for the measurement of current, electrostatic quantity, resistance, electromotive force, power, inductance capacity, watt-hours, phase, power factor, frequency, synchronism, and wave form, from the most primitive to the most sensitive, for refined laboratory practice and rough-and-ready field use, are completely illustrated and described. The treatment is essentially theoretical and mathematical, or at least involves a good technical grounding in order to be read understandingly. For the college student it is the most comprehensive text which has come to our attention.

Practical Electrical Illumination

By Terrell Croft, consulting engineer; 225 pp.; 5½ by 8 in.; published by McGraw-Hill Book Company, New York City, and for sale by Technical Book Shop, San Francisco. Price \$2.00.

This book is based on the excellent idea that the man who designs and installs a lighting system ought to know something about light. So in a simple, though crude manner the author explains, in terms of the electron theory, how light is produced, how it acts and how it is directed and controlled. He then describes the several types of electric lamps and gives an excellent exposition of the theory of illumination design. The application of these principles to all kinds of installations, both interior and exterior, is then illustrated and described in detail. The book is a judicious compilation of widely scattered information adapted to the understanding of an electrical contractor.

THE WESTERN ELECTRIC 1918 YEAR BOOK

The Western Electric Company, which, three years ago established a new mark among jobbers by announcing that it would issue its supply catalog every year, once again scores as a pioneer by publishing its 1918 year book in the early fall of 1917.

Two reasons are given by the company in connection with this announcement. The first is that because of the

popularity which its year book has attained, the entire supply of 1917 books is already exhausted. In the second place, from many quarters there arose a demand for a book to be published early in September which could thus be used by buyers in placing their requisitions for fall and winter stocks.

The new 1918 year book which is now being distributed to the trade follows the plan of uniform list price and basic discount inaugurated by the Western Electric Company three years ago. In addition, manufacturers' list prices are shown on certain standard lines for the convenience of any who prefer to buy on the manufacturers' discount, or who desire an independent means of checking invoices.

Another feature of the book which is unique among all jobbers' electrical supply catalogs is the first section of 16 pages following the index, devoted to a listing of the company's extensive line of printing plates, window displays, stuffers, lantern slides and other forms of assistance for dealers handling Western Electric appliances.

The book consists in all of 1160 pages and contains more than 50,000 items. It is what it purports to be, a real hand book of electrical supplies.

Miscellaneous Bulletins

The General Electric Company has published a 10-page index to descriptive bulletins and sheets, and a 14-page index to supply part bulletins. These greatly facilitate the use of the information supplied by this company.

The Form Q Inductive Motor, 2 and 3-phase squirrel cage type, 60 cycle, 1300 h.p. is the subject of Bulletin No. 180 for the Crocker-Wheeler Company. Details of construction are strongly emphasized therein.

The Engineering Department of the Society for Electrical Development has published Part I of its series on Industrial Heating as a Central Station Load. "The Utilization of the Heat of Electric Energy," Part I traced the evolution of the electric furnace and Part II illustrates and describes various heating appliances and their industrial application.

James E. Allison, Security Building, St. Louis, has published a 155 pp. pamphlet severely criticizing the doctrine of "theoretical depreciation" as resulting in a virtual confiscation of utility properties. This paper was presented by the Consolidated Gas Company of New York for the N. Y. Public Service Commission and constitutes a critical analysis of a paper on "Accounting for Depreciation," by Dr. Weber, the commission's statistician.

The Tenth Annual Report of the Public Service Commission of Oregon contains a record of the commission's activities during 1916. Of special interest is the investigation of the rates of the Portland Railway Light & Power Company, which fills 60 pages of the report. Financial statements of all utilities in the state are given.

"American Sea Power" is the subject of a series of editorials in the N. Y. Evening Mail which have been reprinted in book form for convenient use. The slogan is American control of oil, ships and a merchant marine.

Report of the Committee on Petroleum, California State Council of Defense, 191 pp., 6 by 9 in., 41 plates, presents a comprehensive survey of the fuel oil situation throughout the world with detailed reference to production, transportation, refining and utilization of California oil. Definite recommendations are made for meeting the threatened deficit.

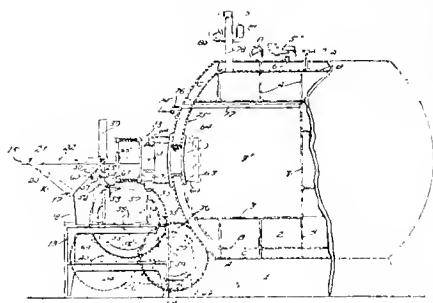
"Light Projection: Its Application," is the subject of Bulletin 32 from the Engineering Department National Lamp Works of General Electric Company by E. J. Edwards and H. H. Magdsick, being one of the papers presented at a course of lectures on illuminating engineering at the University of Pennsylvania during the fall of 1916.

WHAT WESTERN INVENTORS ARE DOING

(Recent months have witnessed many articles of manufacture that make use of luminous effects for dark periods of the day. Watches, for instance, are appearing on the market with hands that appear luminous in a dark room. Below is a recent invention of an electric push button, designed to attain similar results. Other interesting briefs are an apparatus for generating power, a steam generator, a centrifugal oil-burner, and a dynamo-electric machine which follow.—The Editor.)

1,236,020. Apparatus for Generating Power. Washington B. Vanderlip, Oakland, Cal.

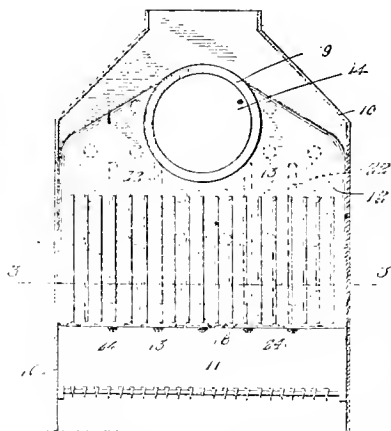
An apparatus for producing power comprising a pressure accumulating and storage chamber, a barrel opening thereinto and provided with a firing chamber, means for inter-



mittently positioning cartridges containing explosive charges within said firing chamber, means for successively exploding said positioned cartridges, means for ejecting the exploded cartridges, a check valve intermediate the firing chamber and said pressure accumulating chamber and seated by the accumulated pressure within said chamber, and a valve-controlled outlet within said chamber for releasing the accumulated pressure therefrom.

1,235,764. Steam Generator. Edward V. Brown, Los Angeles, Cal.

A steam generator comprising a plurality of flat hollow sections having registering intercommunicating openings

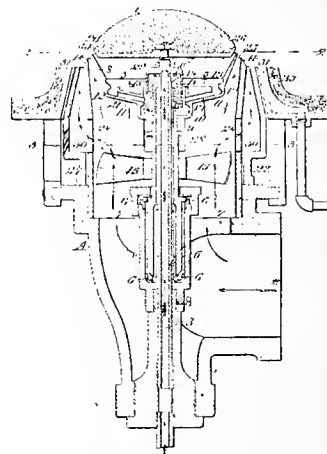


through their upper ends and being independently closed at their lower ends, said sections also having interlocking flanges about the openings, and header secured over the openings of the end sections.

1,236,073. Centrifugal Oil Burner. Milton A. Fesler, Oakland, Cal., assignor to Fess System Co., San Francisco, Cal., a corporation of California.

A centrifugal oil burner having means for the circumferential distribution of an annular oil stream, means for supplying a blast of air above and below said oil stream, means operated by said blast of air to rotate said oil distributing

means, and means to vary the volume of air delivered to said oil stream without varying the speed of the oil distributing means.



1,235,788. Electric Push-Button. Maxwell C. Frank, Piedmont, Cal.

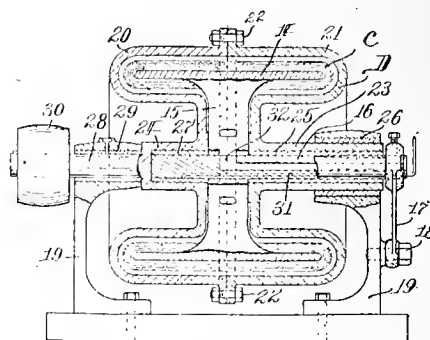
As a new article of manufacture, a button comprising a hollow transparent body having an annular basal bearing



flange formed integrally thereon, layers of luminous powder within said body and a washer adapted to hold said luminous powder therein.

1,236,309. Dynamo-Electric Machine. Louis Frank Johnson, San Gabriel, Cal., assignor, by mesne assignments, to Power Developing Company, a corporation of Arizona.

An induction motor, comprising, in combination, a field having a stationary core and an inducing winding thereon, and a rotor having a sectional incasement of conductive



material entirely inclosing and arranged to be rotatably influenced by said field, each of the sections of said rotor having an inwardly extending member journaled to revolvably support said rotor.

NEW ELECTRICAL DEVELOPMENTS

(Two interesting new electrical developments are now being followed by engineers of the West—the one the new installation of the Pacific Gas & Electric Company near the Spaulding Dam and the other the additional power unit that is being installed for the White River Plant of the Puget Sound Traction, Light & Power Company near Seattle. The former is interesting in that a variable head for power generation is made use of, while in the latter instance a new world's record is to be established in size of water wheel design as a total wheel capacity of 23,000 h.p. is accomplished. Other items of electrical development may be found in the following notations.—The Editor.)

FINANCIAL

SAN FRANCISCO, CAL.—The board of directors of the Pacific Gas & Electric Company has declared the regular quarterly dividend of \$1.25 a share on the common stock of the corporation, payable October 15th, on stock of record September 30th.

SAN FRANCISCO, CAL.—The San Joaquin Light and Power Corporation has sold the issue of \$750,000 of first and refunding 6 per cent bonds recently authorized by the Railroad Commission to Girvin & Miller of San Francisco and Torrance, Marshall & Company of Los Angeles.

SEATTLE, WASH.—Bids are being received by the city comptroller of Seattle for the purpose of each or both of the following bond issues: \$350,000 water extension bonds, maturing in equal series, 11 to 20 years; \$390,000 light and power plant bonds, maturing in equal series, 6 to 20 years. Bonds to be dated October 1, 1917. Rate of interest will be either 5 or 5½ per cent.

SAN FRANCISCO, CAL.—News has reached this city that the Los Angeles Trust & Savings Bank had purchased \$1,000,000 of the \$1,600,000 5 per cent bonds of the Imperial Irrigation District. It is understood that the Pacific Mutual Life Insurance Company and the First National Bank of Los Angeles were associated with the Los Angeles Trust & Savings Bank in the purchase.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company common stock broke sharply Thursday in New York, with 41 bid and 44 asked, as the final quotations for the day. In the local board this stock, which sold last week at 54 and better, displayed pronounced weakness. Frank G. Drum, president of the Pacific Gas & Electric Company, asked with reference to the remarkable decline which this stock has experienced in the last few days, said "All equipment and material used by gas and electric companies have increased amazingly in price of late. Wages, too, are higher, and labor, especially skilled labor, is difficult to obtain and hard to keep. Fuel oil, too which cuts a big figure in our gas business, has doubled in price."

SEATTLE, WASH.—Bids have been opened in the city comptroller's office on the \$390,000 light bonds and \$350,000 water bonds. Only one firm submitted bids on all issues, John E. Price & Company and the highest offer was 96.55, with 5 per cent interest. The light bonds were for extension of the Cedar River system and the water bonds for the new steam unit at Lake Union. Will H. Hanna, chairman of the finance committee of the city council will probably be joined by L. B. Young, superintendent of water; J. D. Ross, superintendent of lighting, and H. W. Carroll, city comptroller, in recommending to the city council Monday the rejection of all bids for the light and water extension bonds. The failure to sell these bonds will probably result in the city going on a warrant basis until next spring.

INCORPORATIONS

PORTLAND, ORE.—The Sherman County Light & Power Company has been incorporated here.

OGDEN, UTAH.—Articles of incorporation have been filed by the Automatic Controller & Manufacturing Company and the following officers have been chosen: Cleveland Red-

field, president; J. W. O'Brien, vice-president; Thos. L. Whitehill, treasurer; Wm. J. Stone secretary. The purpose of the company is to manufacture electrically operated mechanical devices. It is the purpose of the company to build a factory in Ogden.

TRANSMISSION

OATMAN, ARIZ.—In order to facilitate work at the Gold Ore property a power line will be run to the mine, and a complete electric plant will be installed.

LOS ANGELES, CAL.—Bids will be received by the board of supervisors of Los Angeles County up to September 24th for the erection of a power house at the county hospital.

PORTLAND, ORE.—At a special meeting of the Interstate Bridge Commission a few days ago, it was decided to purchase additional electrical equipment to facilitate the operation of the lift span on the new interstate bridge.

PITTSBURG, CAL.—The Great Western Power Company has purchased 14 acres from the Muir estate near Valona, where they have started excavating for one of the largest outdoor type substations in the west. Expenditures at Valona will aggregate \$100,000.

EVERETT, WASH.—The city council has completed a business deal by which Everett has acquired a power site in the Sultan basin, which, according to engineers, can be developed to furnish sufficient power for the use of the city for a long period of time.

TAFT, CAL.—The San Joaquin Light & Power Company, in its efforts to accommodate oil operators with light and power throughout the West Side district, is now building seven miles of line to supply the Reward and Union Oil companies in the Canarris neighborhood. Manager J. B. Carter is in charge of the installation.

CRESCENT MILLS, CAL.—The Great Western Power Company has completed a high power line from Las Plumas to Veramount station on the line of the Indian Valley Railroad. The line will supply power to mines in the vicinity of Crescent Mills. It also will serve as an auxiliary power for Engle's copper mine during the winter months.

SAN FRANCISCO, CAL.—The annual meeting of the Sierra & San Francisco Power Company was postponed for lack of a quorum. The postponed meeting will be held on the second Monday in October, when the annual report will be submitted. The annual meeting of the Coast Valleys Gas & Electric Company was postponed until October 10th.

WHITE SALMON, WASH.—Plans are under way for the building of another large power plant on the White Salmon River by the Northwestern Electric Company, between the present plant and Underwood. It is understood that construction work will soon be started. The plant is to cost about \$400,000. The right of way for the pipe line is being purchased.

OAKLAND, CAL.—Although holding more than \$3,000,000 worth of stocks and bonds in the Sierra & San Francisco Power Company as security on a \$25,000 note, William Bayley has not been able to collect the money, he alleges in a complaint against the company and its board of directors,

which he filed in Oakland. Bayley asks for the sale of property in order to raise the amount due on the note.

PHOENIX, ARIZ.—The city council is asking for bids on a frequency changer for the gas plant. This will cost in the neighborhood of \$10,000 and will add greatly to the capacity of the plant. The council, in asking that the town vote bonds in the sum of \$125,000 for the purchase of the plant was taking into consideration the necessary enlargement of the service.

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company has decided to put in chain grates and automatic stokers in the steam electric power plant at Georgetown, in which to burn ordinary coal instead of oil. This equipment on this plant will cost between \$200,000 and \$250,000. About the same expense will be involved in the enlargement of the plant on Western avenue.

AZUSA, CAL.—Another power project is being planned for the San Gabriel Canyon by the United Light & Power Company of Los Angeles. G. W. Gilbreth, an engineer for the company, was in the city conferring with engineers who are making a preliminary survey for the dam site. The plant will cost \$500,000 and will provide 6000 kilowatts. Later the company expects to put in another dam and treble the size of the plant.

CARSON CITY, NEV.—A franchise for the establishing of a power transmission line was granted by the board of county commissioners of Storey County to the Nevada Valleys Power Company, which proposes to erect a plant to cost approximately \$300,000 in Storey County near the McCarran ranch on the Truckee River. From that point power will be distributed to the entire western portion of Nevada, and may extend to other adjacent fields, if conditions warrant.

SACRAMENTO, CAL.—Agents of the Great Western Power Company have been in Sacramento the past few weeks buying strips of land to enlarge their right-of-way. It is the purpose of the company to add 34 ft. to its right-of-way, which is at present 50 ft. wide, from the site of the power plant in Big Meadows to the Bay region. As soon as the rights-of-way are purchased it is understood that the company will construct another power line, paralleling its present lines, from its generating plant of San Francisco. In most instances property owners are willing to give up the narrow strip on the company's terms.

LOS ANGELES, CAL.—Contemplating the development of 22,000 h.p. electric energy, the United Light & Power Company, with headquarters here, expects to start work within 30 days on a project that will mean the construction of a big dam at the mouth of the Prairie Fork, in upper San Gabriel Canyon, and the building of two immense power plants. The dam, which will be of concrete of Eastwood type will be 200 ft. high, 50 ft. at the top and 100 ft. wide at the bottom. The first power plant will have a drop of 1,248 ft. and will develop 8000 h.p. From it will run a power sluice, 6 miles long, with a drop of 1818 ft. to the second power house, where 14,000 h.p. will be developed. G. W. Gilbreth and F. C. Riley are owners of the concern. By construction of 7.7 miles of transmission line it will be possible to connect with any important electric company of Southern California. The total cost of the project is figured at \$2,000,000. G. O. Newman is chief engineer of the company.

TRANSPORTATION

SAN FRANCISCO, CAL.—The contract has been awarded to the U. S. Steel Company, the lowest bidder for furnishing track special work for the Municipal Railway System.

SAN BERNARDINO, CAL.—The Pacific Electric Railway Company is to operate an auto-bus service between San Bernardino, Patton, Highland and intermediate points, San Bernardino County.

SAN FRANCISCO, CAL.—In a letter sent to the supervisors by the Ocean Shore Railroad a change in the company's franchise is proposed to give the railroad the right to use motor cars instead of electricity.

SEATTLE, WASH.—Bids are being received by the board of public works of the city of Seattle for the improvement of Division "A" of the Municipal Street Railway by constructing a trestle approach on Thorndyke avenue.

SAN FRANCISCO, CAL.—The contract for the construction of outer tracks for the Municipal Railway from Van Ness avenue to Castro street, on Market, was let by the board of works to James M. Smith for \$36,959.78.

LOS ANGELES, CAL.—The West Jefferson Improvement Association has petitioned the city council to compel the Los Angeles Railway Company to extend the West Jefferson car line from Fourth avenue to Ninth avenue.

OAKLAND, CAL.—The city council has requested the San Francisco-Oakland Terminal Railway Company to install modern improvements on its various lines about the city. Improvements by the company will be made on College avenue and West Sixteenth street.

STOCKTON, CAL.—The Central California Traction Company has granted an increase of wages as urged by its employees. An increase of 3½ cents per hour to passenger conductors, motormen and brakemen is allowed, and 5 cents to freight conductors and brakemen.

SANTA ANA, CAL.—An ordinance has been adopted by the board of supervisors granting to the Pacific Electric Railway Company a franchise to construct and for 50 years maintain an electric railroad along and across certain public roads and highways in Orange County.

PHOENIX, CAL.—A project embodying the construction of an electric railroad through three states, opening of one of the largest coal fields in the United States, has been submitted to the Arizona Corporation Commission for approval and authority to organize and transact business.

OAKLAND, CAL.—General Manager W. R. Alberger of the San Francisco and Oakland Terminal Railway, in a communication to the city council, outlined the proposed plans of the company for improving the car tracks on Telegraph avenue, College avenue and West Sixteenth street.

ORANGE, CAL.—An ordinance has been adopted by the board of supervisors granting to the Pacific Electric Railway Company a franchise granting the right to construct and for 50 years maintain an electric railroad over and across certain public roads and highways in the county of Orange.

YUCAIPA, CAL.—It has been announced that the Pacific Electric Company will extend its line from Redlands to Yucaipa at once. If materials can be secured and deliveries are assured it will start work in a few weeks so that the line can be completed by time crops are ready to move next summer. The line will be 13 miles long.

SAWTELLE, CAL.—Within 30 days the Pacific Electric Railway Company will begin the improvement of its roadbed, on the Santa Monica line through Sawtelle, with new ties, new and heavier rails, rock ballasting and oil macadam paving. An investment of about \$140,000 will be made. The improvement will cover a distance of about 9000 ft.

COLVILLE, WASH.—A petition has been presented to the board of county commissioners of Stevens County, Washington for a franchise to the Northport Power & Light Company, to construct an electric transmission line for light, heat and power over the Rossland road, from the international boundary line to the city of Northport, Stevens County, Wash.

REDLANDS, CAL.—The Pacific Electric Railway is to build into Yucaipa Valley. A definite decision to that effect has been arrived at and the route to the crest of the hills, where the paved roads to Yucaipa and Beaumont branch has been determined. Surveyors were in the valley for five

months, since last November, and they ran four lines through the hills, finally securing a grade that does not exceed two and one-half per cent. Traffic Manager Pontius says the road will be built.

SANTA ANA, CAL.—Engineers for the Pacific Electric Company have submitted a plan for extending the line into Tustin to members of the city council. According to the revised plan the Pacific Electric will go out East Second street on the Southern Pacific tracks, will curve back of the collar factory toward Evergreen, will cross that street to First, cross that street curving across Minnie and Pine, will curve back again to Pinal Dome building, until it hits the Southern Pacific right-of-way at Walnut.

SAN FRANCISCO, CAL.—The official financial report of the Municipal Railway of San Francisco for the fiscal year ended June 30, 1917, has not yet been completed, but unofficial figures obtained from Bookkeeper Scott indicate that the year's business will show an actual profit of \$42,855. This is a smaller showing than for the preceding year, when there was a net profit of \$74,767, but the decrease is explainable by the fact that in the fiscal year 1915-1916 the Exposition was at its height, and the Municipal Railway was enjoying its greatest income from that source.

LOS ANGELES, CAL.—Extensions of two car lines of the Los Angeles Railways Company system have been recommended to the city council by the public utilities committee. One was the West Jefferson Street line, which it is proposed to extend from the present terminus at Fourth avenue to a new one at Ninth avenue. The other extension was that of the South Park Avenue line from Slauson to Manchester avenue. In each case the committee held that the request of the committees petitioning for the improvement was reasonable and the matter was passed along to the board of public utilities for action.

ILLUMINATION.

HANFORD, CAL.—The city trustees have passed a resolution of intention to give Hanford's down town district an electrolier lighting system.

LIVINGSTON, CAL.—The supervisors have called a special election to vote upon the matter of the formation of a lighting district in Livingston.

SUMPTER, ORE.—According to Robert E. Strahorn, who is the head of the Sumpter Power & Water Company, the electric plant will be rebuilt at once.

LOS ANGELES, CAL.—Paving the way for better lighting in the vicinity of Culver City and Westgate, the city council has created the Culver City Lighting District.

SANTA ANA, CAL.—An election will be held on October 11th for the purpose of determining the question of the formation of the Tustin Lighting District of Orange County.

GARDEN GROVE, CAL.—An election will be held October 11th for the purpose of determining the question of the formation of the Garden Grove Lighting District of Orange County.

MOJAVE, CAL.—An election will be held here on October 6th for voting for or against the Mojave Lighting District, which is to be formed from the south half of section 8 and all of section 17, except certain parts.

NAPA, CAL.—Bids have been opened to supply the city with 350-80 candlepower lights as follows: H. Schwartz Co., \$1.06 per lamp; Winship Beard Co., \$1.00 per lamp; Earl Wilson, 98c per lamp. The contract was awarded to Mr. Wilson.

CHICO, CAL.—The board of city trustees has authorized the city to advertise for bids to furnish the city with light and power for a period of three years, intersection lights for the residence section and power for the electrolier system.

LOS ANGELES, CAL.—Notice is given that the city council adopted an ordinance of intention to order necessary

appliances to be installed on North Broadway between California and First street and on Broadway between First and Tenth.

FRESNO, CAL.—At a meeting of the directors of the Sierra Chatauqua Association held a short time ago, plans for next year were considered. Among the improvements are: to have the San Joaquin Light & Power Company light the Chatauqua grounds with electricity.

WATTS, CAL.—The board of trustees have ordered the improvement of a portion of Main and other streets by the construction of ornamental electric light standards with the necessary conduits, wires and other appurtenances, in accordance with plans and specifications on file with the city engineer and city clerk.

PENDLETON, ORE.—At a special meeting of the city council a new street lighting contract was made with the Pacific Power & Light Company for a period of 5 years. Instead of arc lights, Mazda electric lamps will be installed. The lamps will be 400 and 600 candlepower on the business streets and 350 candlepower in the residence sections.

VICTORVILLE, CAL.—Improvements of considerable magnitude started by the Southern Sierras Power Company in this county. A new line is to be built from the substation west of Barstow, a distance of 41 miles. The new line will require in the neighborhood of 60 days for construction work will represent an investment on the part of the company of about \$115,000.

WATSONVILLE, CAL.—This city has been offered a new system for street lighting. The Coast Counties Gas & Electric Company has made a proposition to the board of aldermen to expend the sum of \$5000 in installing 142 of these new lights if the city will pay a monthly light bill. It is planned by the company to install 80-80 watt lights 37-100 watt lamps and 25 of the 250 watt variety.

SACRAMENTO, CAL.—A rehearing has been granted by the Third District Court of Appeal in the case of the town of Suisun against the Pacific Gas & Electric Company. The original action was brought by Suisun to compel the corporation to pay a tax on its franchise. The court held the company was entitled to a lighting franchise under the state constitution and that such franchise was exempt from taxation by municipalities. Recently, however, the Appellate Court's attention has been called to a Supreme Court decision in which it is held that both power and lighting franchises are taxable; hence, the granting of the rehearing.

PORTLAND, ORE.—What is considered as the most significant lease deal and building improvement plan put forward in Portland for many months materialized when William C. Alvord, manager of the Henry Failing estate, announced that he had leased space on the four lower floors of the twelve-story class A building at the southeast corner of Fifth and Alder streets, and that he had ordered alterations and improvements in the building that will cost probably about \$200,000. Under the new arrangements the vacant portion of the lower floor, all of the second and third floors, and most of the space on the fourth floor will be occupied, commencing January 1st by the consolidated offices of the Pacific Power & Light Company and its subsidiary concerns, the Portland Gas & Coke Company and the Walla Walla Railway Company.

TELEPHONE AND TELEGRAPH

SAN FRANCISCO, CAL.—The Asher Electrical Company, of which Jefferson Asher is the head, received the contract to install electrical equipment consisting of telephone poles and transmission lines, at Angel Island.

OAKDALE, CAL.—Plans are now being made by the Pacific Telephone & Telegraph Company for the construction of a new line between Oakdale and Modesto. The new line will be built to handle toll business.

GLENDALE, CAL.—J. Downey Company of San Francisco, has been awarded the contract for the construction of Sunset Telephone building, to be erected in Glendale.

BLYTHE, CAL.—Installation of telephone service in the valley will be put through to completion as fast as possible, it is stated. Excavation work for the exchange building has been started.

RIVERSIDE, CAL.—The long-promised consolidation of the two local telephone systems has become a reality. Local officials of the Pacific Telephone and Telegraph Company, which some months ago concluded the purchase of the Home system, have announced that the two systems are connected up.

LOS ANGELES, CAL.—The Western Union Telegraph Company has taken over the telegraphic service along the line of the Tonopah and Tidewater Railroad. The service now reaches beyond Ludlow to Death Valley Junction, Silver Lake, Tecop and Zazriskie, Cal., and further connections to Ryan, Riggs, Shoshone, Acme, Cal., and Pahrump, Nev.

OROVILLE, WASH.—The Okonogan Valley Power Co. has made application to the town council of Oroville for a franchise to erect and maintain poles, wires, conduits and other necessary appliances and conductors for the transmission of electricity for lighting, heating and power purposes in the town of Oroville Wash. A hearing will be held early in October.

STOCKTON, CAL.—Stockton's growth is responsible for an appropriation by the Pacific Telephone and Telegraph Company of \$59,920 for an additional phantom circuit between Sacramento and Stockton, for additional equipment in the central office, for an improvement in the service between Stockton and Fresno, and for new toll circuits at various points in the Stockton-Fresno division.

LOS ANGELES, CAL.—To improve service in Southern California, the Pacific Telephone and Telegraph Company has set aside \$200,000 for purchase of additional equipment and improvement of its present paraphernalia. Principal improvements are as follows: Glendale, central office, \$77,410; copper circuit between Campo and El Centro, \$38,020; copper circuit between San Diego and Campbell, \$30,080; trunk cables between Ocean Beach and San Diego, \$15,090; various improvements at Orange, \$9,200; pole lines between Los Angeles, Whittier and Artesia, \$9,240; rerouting line between Redondo and Redondo Junction, \$7,150; construction work in Ocean Beach, \$3,880; poles and cables at Orange, \$1,430; remodeling plant at Ocean Beach, \$2,360; construction work, Kern County line to Bakersfield, \$2,440; circuits between Torrance and Los Angeles, \$2,110; cable work at Brawley, \$670; magneto switchboard at Calexico, \$570.

IRRIGATION

MEDFORD, ORE.—By a vote of more than 2 to 1, the ranchers in the vicinity of Medford voted in favor of establishing an irrigation district.

VICTORVILLE, CAL.—Notice has been given that an election will be held in Victor Valley Irrigation District, October 1, to determine whether or not such a district shall be organized.

KLAMATH FALLS, ORE.—Reports of another projected irrigation unit for the Klamath reclamation service here has been made by H. M. Stastney of Malin, who operates a dry land ranch in that vicinity and is most anxious to become one of the irrigated farmers as soon as possible.

PHOENIX, ARIZ.—The stockholders of the River Valley Water Users' Association have voted in favor of amending articles of incorporation, so that care, operation and maintenance of the project under Roosevelt Dam can be taken over by them. A few changes of organization will be made.

ORLAND, CAL.—Directors of the Orland Unit Water Users' Association have voted down the proposition to allow

water to be furnished from the Orland Project supply for irrigation upon the Anchorage Farm, outside the project, at least until such time as it shall have demonstrated that there is a surplus which can be safely used for such purpose.

REDDING, CAL.—Directors of the Happy Valley irrigation district have decided to issue \$300,000 worth of bonds to build the Missellbach dam and the Hoover Creek tunnel. Stockholders and directors have agreed this be done and Attorney Francis Carr, who has steered the farmers safely through their troubles of the past year, now is drawing up an application to the State Railroad Commission for approval of the plant.

OAKDALE, CAL.—The Oakdale irrigation district can vote sufficient bonds to build all necessary reservoirs by bond issue, according to the advice given the directors by Attorney P. H. Griffin. Although the law limits the bonding capacity to 60 per cent of the valuation of the district, which is approximately \$4,000,000, making the apparent limit \$2,400,000, Mr. Griffin stated that the actual valuation instead of the assessed valuation would be considered by the bond commission in determining the validity of the bonds.

KLAMATH FALLS, ORE.—That the details for the formation of an irrigation district for the farmers of the Klamath basin are being completed as rapidly as possible is indicated by the fact that an order for a special meeting of the county court in October to consider the petition for a special election of the water users, has now been issued by the county court. Farmers and government officials who have gone into the matter carefully declare that there is every reason for making this change, which will do away with the Water Users' Association.

MERCED, CAL.—Pursuant to the action of the Company Farm Bureau, indorsing a proposal to campaign for the organization of a county irrigation district, the following committee will report to the directors at the November session on the advisability of the undertaking: E. G. Adams, M. A. Marshall and A. H. Poor. Federal Drainage Investigator Engineer Walter Weir is to make a survey of the county's drainage and irrigation needs and possibilities before the committee reports.

MANTECA, CAL.—The South San Joaquin irrigation district has taken over the Keystone Construction Company's contract for the remaining work on the Woodward reservoir. The work on the reservoir has been satisfactory, and has been accepted by the district, but the principal object in taking over construction of the remainder of the work is to give the district the opportunity of finding the most important part of the work at once, and leaving that part of it that is not needed at this time until the future. The Keystone Construction Company had practically completed the work on dams Nos. 2 and 3, except the puddling and putting on the finishing touches. Dam No. 4 has not been touched as yet, but this is not important, and the district will finish the work on the other dams first.

PARADISE, CAL.—Work of constructing the reservoir and dam for the Paradise Irrigation District on Little Butte Creek, Butte County, is being rushed that the big earth fill may be ready this year before the winter floods come. Already the tunnel for the outlet of irrigation water has been finished. The Paradise dam will hold back enough water annually to cover the entire district a foot deep. This is regarded as sufficient for irrigation needs on the ridge, which already enjoys ample rainfall during the winter season. The acreage in the district is about 10,500, practically all of which is capable of cultivation and much of which is already planted to trees. The dam at the base will be 400 feet thick, entirely of earth fill. Laying of pipe for the distributing system of the Paradise irrigation district will be commenced within two weeks, according to the announcement of the directors. The pipe will be laid at the rate of a mile a day.

In This Issue *The call to service for Women in the industries of the West—and departments of vital interest to men of the electrical industry throughout this vast section*

JOURNAL OF ELECTRICITY

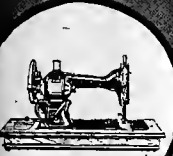
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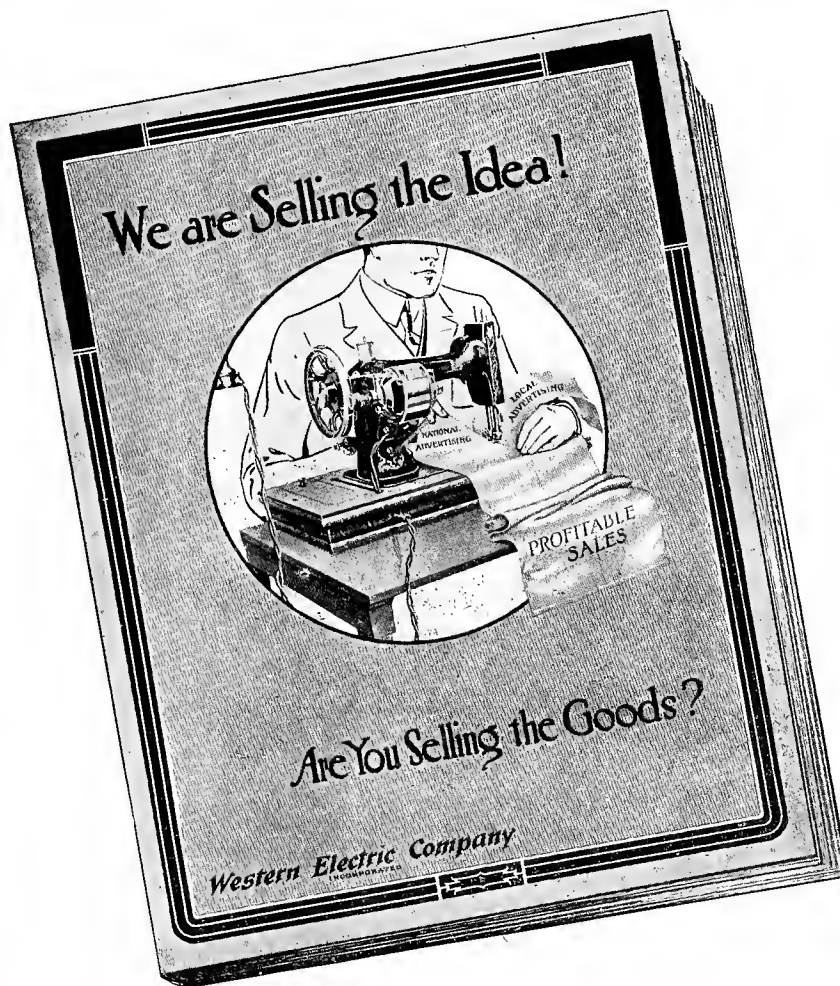
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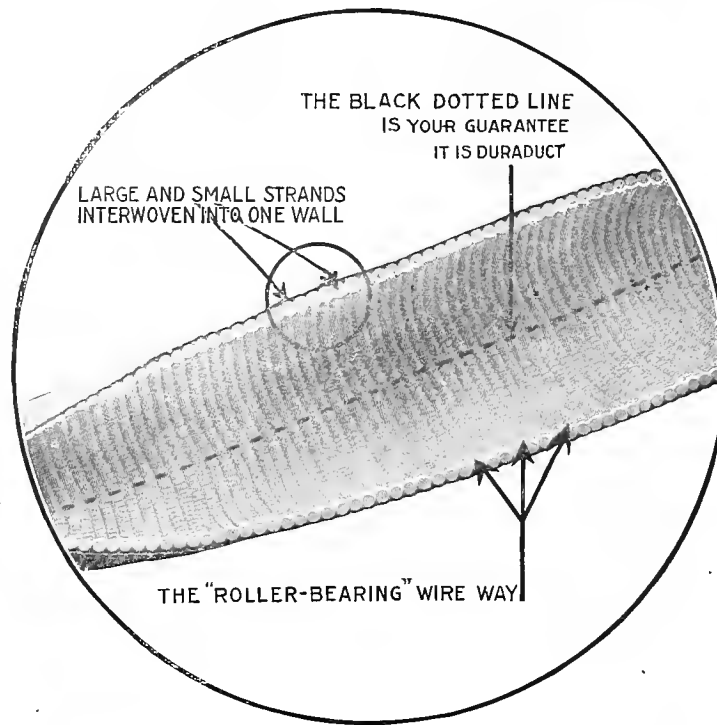
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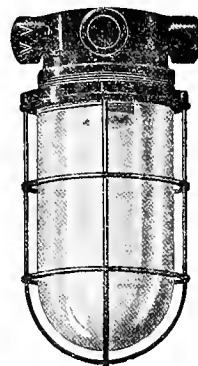
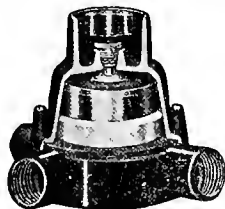
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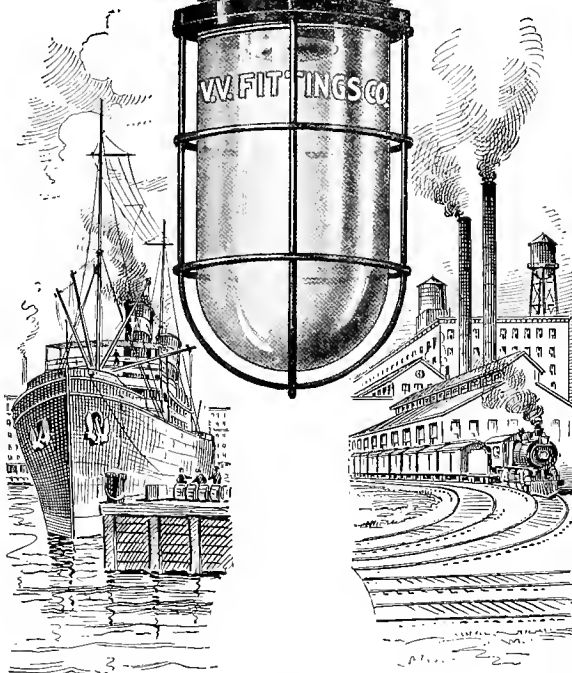
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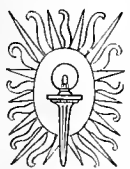
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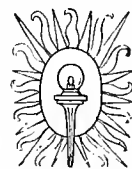
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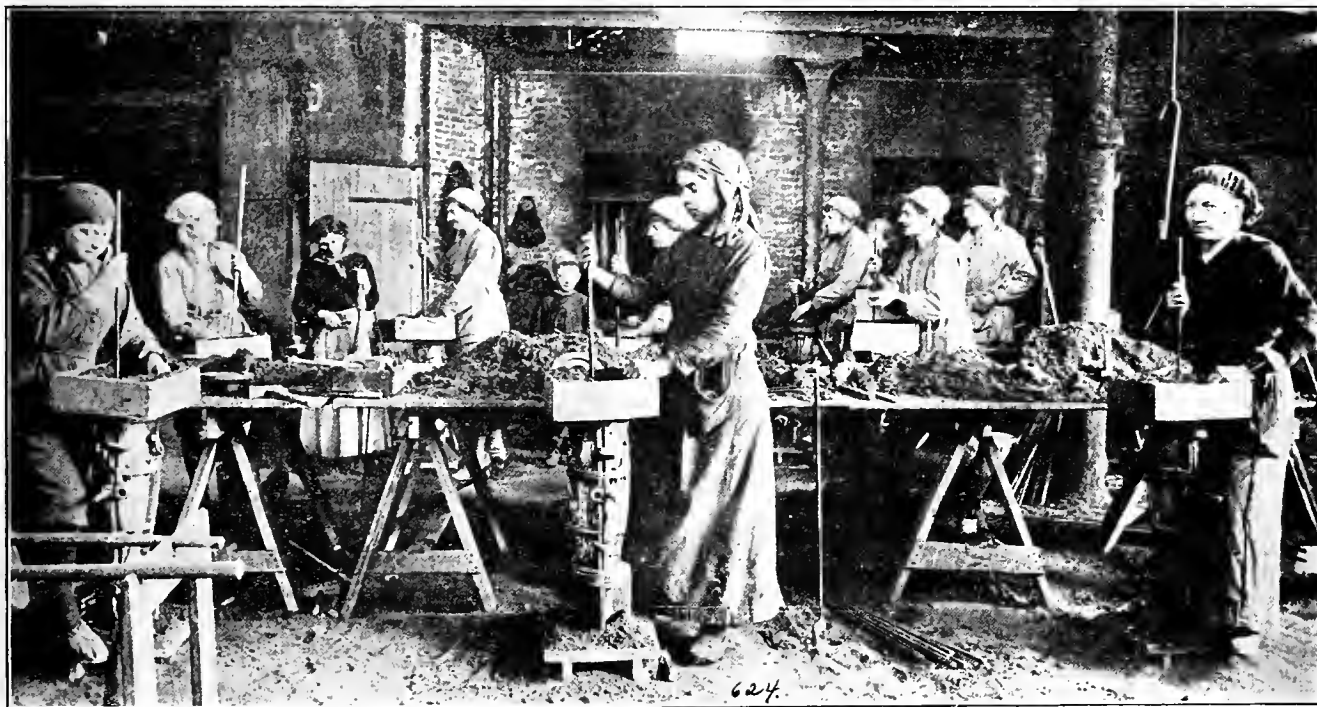
INDUSTRIAL OPPORTUNITIES FOR TRAINED WOMEN

BY CLOTILDE GRUNSKY

(Service to the nation is making its striking appeal on all sides. The crisis due to the increasing scarcity of men in the industries makes the advent of women, in new and untried fields of endeavor, an appalling necessity. A casual glance at the technical and industrial activities of England reveals the marvelous new tasks that women are efficiently undertaking in the British Isles, as was called to the attention of our readers in editorial comment in the Journal of Electricity for June 1, 1917, page 455. Here is a brief survey of present industrial activities for women throughout America, which has been gathered by the author in an extensive nation wide research for the Collegiate Alumnae of America, as announced in our editorial columns. This brilliant writer will in the future devote all of her time to editorial activities of the Journal of Electricity in the capacity of associate editor and in charge of service and welfare work.—The Editor.)

Due to the present national crisis, women, inspired by a desire to do their bit, are looking to the industries as avenues of service. The spirit which led an English young woman of means to offer her

war cease tomorrow, on the other hand, a revolution in the employment of women would already have been accomplished, the effects of which will be permanent.



WOMEN MOULDERS IN A FRENCH MUNITIONS FACTORY

America is faced with a shortage of labor such as Europe has already been forced to meet—but our women will rise to meet the need as have those of France. The picture is copyrighted by the International Film Service.

services as a cook because "cooks were needed," is stirring in our own young women and making them ready for service in the factory and in the yards—wherever they may be in demand.

This emergency help, however, called upon in the moment of need, is of necessity untrained in character, and in so far as it is inspired merely by the idea of national service, is temporary. Should the

Much of prejudice has already gone from the mind of the employer. Though he may not as yet have employed a single woman in a position not hitherto open to her, yet he has looked forward to the time when he might have to do so and has considered the case as not quite an impossibility. He has looked to the example of England with a new interest and noted how the number of women workers in indus-

sented in the business and industrial world in anything like the numbers prevailing elsewhere. The reasons for this are two. In the first place, the employer has not learned to look for his labor supply to the women trained industrially or educationally—he is not familiar with the woman worker who has proved herself (elsewhere) capable of earning more than her untrained sister, and he does not offer sufficient salary inducement to attract women from the teaching profession.

The college woman in particular, on the other hand, has not learned as yet to take advantage of the opportunities open to her. The traditional fields of teaching and library work have been unusually well paid and uncrowded here in the west until recently, and women have not been forced to face the daring of the newer occupations.

The war, however, is changing this. An actual shortage of men in the face of increased industrial activity is forcing employers to look to women as a possible source of help. We read of chemical companies taking women into their laboratories, telephone companies into their service departments. Women taxicab drivers and railroad hands are still novelties, but there is some promise that we may become better acquainted with them.

A new era is at hand, whether we will or no. In the present emergency we must look for women to enter those lower branches of technical work where they may begin as untrained workers and gain their special education in their work. With the new ideals of service and the breaking down of many barriers of prejudice, we must count on women preparing themselves for the higher fields and taking their places side by side with the men, supplementing rather than supplanting their work.

THE EFFECT OF MOUTHPIECES ON THE FLOW OF WATER THROUGH A SUBMERGED SHORT PIPE

An investigation has been completed by the Engineering Experiment Station, University of Illinois, under the direction of Fred B. Seely, associate in theoretical and applied mechanics, to determine the effects of mouthpieces upon the flow of water through a submerged short pipe. A knowledge of the extent of the loss of head due to contraction or expansion of a stream is of considerable importance in a variety of hydraulic problems. For example, it may be possible, through attention to the shape and angle of connections and intakes to increase the flow through the suction and discharge pipes of low head pumps, through large valves, through locomotive water columns, through the sluiceways of dams, through culverts and short tunnels, etc.

It is to be noted that losses of head due to contraction or expansion of a stream, which may in themselves be of relatively little consequence, may have a considerable influence upon subsequent losses because of the turbulent motion started by the contraction or expansion.

The results of the investigation are set forth in detail in Bulletin 96 of the Engineering Experiment Station, copies of which may be obtained gratis by addressing C. R. Richards, Director, Urbana, Illinois.

WHY THE SHIELDS WATER BILL SHOULD PASS

(Here is an excerpt from The Congressional Record setting forth tersely the reasons why the Shields Water Power Bill should be passed by Congress. The statement is by Senator Jones of Washington. Frequent editorial comment has been made in the columns of the Journal of Electricity relative to the crying need of just such legislation as this in order that hydroelectric development in the West may be made an efficient tool for the upbuilding of a vast empire, potent with possibilities of industrial and agricultural prowess under reasonable governmental encouragement for private enterprise. —The Editor.)

It is vitally important to the economic and commercial welfare of this Nation that Congress no longer delay the enactment of laws under which our wasting water powers may be developed. The following brief statement shows the importance of the immediate passage of such legislation to the State which I have the privilege of representing in part in the United States Senate:

Of the 9,700,000 water horsepower in the State of Washington requiring Federal consent before it can be utilized, but 96,000 horsepower, or 1 per cent has been developed, and the remaining 99 per cent, or 9,600,000 horsepower is going to waste. Meanwhile we are importing coal from Canada; vast areas of silent desert lands, which, given water, would yield great harvests in these days of food shortage, are held back from reclamation through lack of cheap electric energy for operation of pumping plants; three transcontinental railroads are unable to electrify their systems across the State, and industrial plants, the establishment of which would give us the diversity of industry so badly needed to further our progress and prosperity, are prevented from building.

By provisions in the river and harbor act of 1890 and 1899 Congress has prohibited the placing of dams in navigable streams without the consent of Congress in each case. No executive authority, unless the stream lies wholly within a single State, in which case the State legislature may grant the authority, subject to approval of plans by the Secretary of War. As navigable streams almost invariably touch or traverse more than one State, the exception is unimportant.

An existing statute passed by Congress in 1910, known as the general dam act, prescribes the terms under which dams may be placed in navigable streams when Congress grants specific consent. This statute, even if made operative by an enabling act, makes requirements which render investment unsafe and effectually prevents development. During the first two years after the passage of this statute Congress granted its consent to the development of 12 water-power projects in navigable streams, of which but two have been developed, and their financing was only made possible because they were adjuncts to existing systems.

The other 10 could not be financed under the restrictive terms of the permits granted. Not a single water-power project has been developed in a navigable stream during the past five years. During these years water-power projects actually formulated and ready for development, located in 17 Southern and Western States, aggregating 2,122,000 horsepower, have been prevented from development, as no responsible banker,

trustee, or business man would invest a dollar upon the security afforded by such permits. The production of this energy through utilization of water horsepower now wasting would save annually 8,427,000 tons of coal, would allow the labor of 7,000 men to be used for other much-needed purposes, and would permit the use of thousands of cars for carrying merchandise instead of coal. Furthermore, by these river improvements 1,160 miles of inland waterways would be opened to navigation without the appropriation of Government money.

The importance of action is realized by Congress, which has had the enactment of a new navigable stream water-power law under consideration for the past four years. A bill drawn and introduced by Senator John K. Shields, of Tennessee, was passed by the Senate at the last session by a vote of 46 to 22, after a discussion covering a period of five weeks, during which time every phase of the question was carefully considered. The bill was amended by the House and sent to conference, was not reported out, and died with the close of the last Congress.

Senator Shields reintroduced the bill (No. 1419) at the present session, and it has been reported without amendment to the calendar by the Commerce Committee, of which I am a member, and will undoubtedly again be passed by the Senate when its consideration is reached. The bill has been criticized by so-called conservationists for reasons which I shall not attempt to controvert because, to my mind, they are manifestly impracticable and, if adopted, would effectually prevent development.

The bill appeals to me as an orderly, masterly product of high-class statesmanship. It safeguards every public interest, and yet its terms are fair toward those who would engage in the naturally hazardous business of development of water powers. Senator John K. Shields, the author of the bill, is one of the most respected members of the United States Senate. He was formerly chief justice of the Supreme Court of Tennessee, and the development of its water powers is of greatest importance to his State. I am glad to be able to say that this important national question was not made a party issue in its consideration by the Senate, and I am glad, as a Republican Senator, to be able to line up alongside the great Democratic Senator from Tennessee in approval of his views upon this subject.

The Shields bill authorizes the Secretary of War to issue permits to develop water powers in navigable streams to properly qualified applicants who, in his judgment, are best fitted, in the public interest, to develop the water resources. The bill sets forth at length general terms and stipulations, and the Secretary of War is made the administrative authority to carry them into effect. The bill provides for a permit period of 50 years, at any time after which the Government may, on two years' notice, take over the property for itself or for a subsequent grantee by paying the fair value of the property, not including the rights granted by the Government. The bill provides for protection of the public interests as follows:

(a) Water-power projects for which permits are issued must be such as in the judgment of the Secretary of War shall be best adapted to a comprehensive plan for the improvement of waterways for all uses

and produce the highest practicable power development.

(b) The public-service commissions of the States in which the water powers are located are given control of rates and service when the business is intrastate, and the same regulatory authority is conferred upon the Interstate Commerce Commission when the business is interstate.

(c) The Secretary of War is given authority to examine the books of the grantee and to require them to submit sworn statements of every detail of their business transactions.

(d) Provision is made for cancellation of the grant in case the grantee fails to comply with the terms.

(e) Unlawful trust or monopoly or restraint of trade is forbidden.

(f) The grantee is required to install, at his own expense, locks, booms, sluices, lights, signals, or other structures in aid of navigation purposes, and furnish, free of cost, power for operation of same.

(g) The grantee must reimburse the United States for the cost of navigation and supervision incidental to the transaction.

(h) The grantee is required to pay reasonable charges to the United States for benefits accruing from headwater improvements established and maintained by the United States and for the use of any Government land used in power development.

The bill provides that work must be begun within two years from the date of the permit and completed within such time as may be specified by the Secretary of War, and provides for diligent, orderly, and reasonable development and continuous operation of the water power, subject to market conditions. The bill provides that contracts extending beyond the life of the permit for sale of energy may not be made without permission of the public-service commission of the State in which the water power is located.

The Shields bill is distinctly a compromise measure. It is the product of the long conflict of views and of the efforts of the Senate to deal intelligently with the subject. Like all compromise measures, it is probably not completely satisfactory to anyone, but as a whole it concededly does safeguard the public interests and concededly is fair enough to capital to secure investment in water powers. In my judgment, it is not at all subject to the objections which have been most vehemently urged against such proposed legislation in the past. Consequently it can and should be supported by those who have been chiefly interested in insisting upon public safeguards and also by those whose chief interest has been to secure development of the great resources. It is to be hoped that, in the public interest, this bill may be accepted by both Houses of Congress, be signed by the President, and speedily become a law.

The American Institute of Electrical Engineers intends to devote a meeting before long to the subject of industrial research. The discussion at that meeting should elicit more than usual interest at this stage of the world struggle between autocracy and democracy, because the issue in the struggle largely depends upon the relative effectiveness of co-operative effort, including industrial research.

THE ELECTRICAL DEALER'S PROFITS

BY A. H. HALLORAN

(Double your cost price to find your selling price! Seems startling, doesn't it? Yet it is a fairly good rule for the electrical dealer who does not know his exact cost of doing business, because it is based on the experience of those who do. This is the beginning of a series of articles on current problems that are confronting the electrical contractor and dealer that, it is believed, will prove unusually timely and helpful. The discussion for the next issue will be on "overhead" while for the issue following the important subject of cost accounting will be treated.—The Editor.)

Your selling price must be large enough to care for (1) the delivered cost of the article, (2) the cost of doing business, (3) a living profit on the sale. Of course every dealer knows the cost of an article, most of them know their cost of doing business, but few are making a respectable profit.

Let 100 per cent represent the selling price. Then, according to our arbitrary rule, 50 per cent represents the cost price because double 50 per cent equals 100 per cent. This leaves 50 per cent to cover the cost of doing business and the net profit.

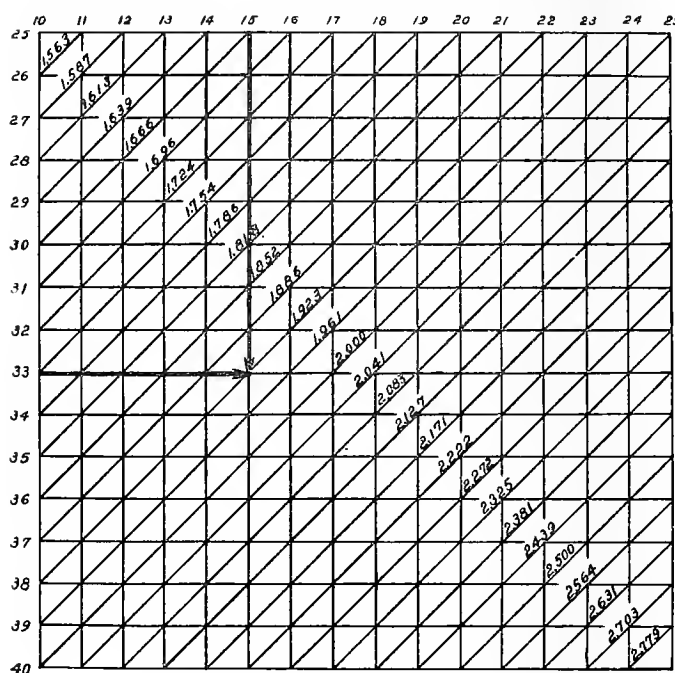


DIAGRAM FOR FIGURING PROFITS

This chart graphically represents the multiplying factors to be used in finding the selling price from the cost prices for various overhead and profit percentages. The horizontal lines show overhead figures from 25 per cent to 40 per cent; the vertical lines show profit figures from 10 per cent to 25 per cent; the diagonal line through the intersection of a given horizontal "overhead" line and a given vertical "profit" line shows the figure by which the cost price should be multiplied to give the selling price. The arrows show an example where the cost price should be multiplied by 1.923 to find the selling price and cover 33 per cent overhead and 15 per cent profit. Conversely if a selling price be found to be 1.923 times the cost price it allows 15 per cent profit with 33 per cent overhead, 18 per cent profit with 30 per cent overhead, etc.

Pacific Coast electrical contractors and dealers have found that the cost of running a retail electrical business varies from 30 to 35 per cent. Where contracting is done on the side the figure is a little lower. Other retail specialty shops have an overhead of from 35 to 40 per cent. So 35 per cent is a safe figure to use. This leaves 15 per cent for profit; $50 - 35 = 15$. Most dealers are satisfied with a profit of $12\frac{1}{2}$ per cent and are handling goods carrying as low as 10 per cent profit. But assuming 35 per cent overhead and 15 per cent profit, it is obvious that the selling price must be twice the cost price.

The accompanying diagram gives multiplying factors to be used in determining the selling price for

overheads ranging from 25 to 40 per cent and profits of from 10 to 25 per cent. Merely find the figure at the intersection of the horizontal "overhead" line and the vertical "profit" line. For example, the arrows on the chart show that to get 15% profit with 33% overhead, multiply the cost price by 1.923 in order to determine the selling price. Thus an article costing \$1.55 should sell for \$3.00 under these conditions.

As the selling prices of many electrical devices used in the home are nationally advertised by the manufacturers, the dealer wants to know how much profit he makes in the sale. For instance, a certain make of floor lamp is advertised to sell at \$7.50. It costs the dealer \$4.50. As \$3.00 is 40% of \$7.50, this leaves 40% to cover his overhead and his net profit. Consequently, with 30% overhead the net profit is 10 per cent. In order to find your net profit, merely subtract your overhead from the per cent figure obtained from dividing the selling price by the difference between the selling price and the cost price.

Another way of finding your profit is to divide your selling price by your net price and find the nearest corresponding figure in the diagram which will show the net profit for a given overhead. For example, \$7.50 divided by \$4.50 equals 1.666, which, according to the diagram, corresponds to 10% profit with 30% overhead.

It hardly seems necessary to call attention to the fact that these profits are figured on the basis of the selling price, and not the cost price. Electrical men recognize the fallacies in using the cost price as a basis for figuring prices. In the first place, there is no profit until the article is sold. All expenses are figured on the basis of sales and in order to be consistent, profits should likewise be figured on the selling prices. Until the sale is made expenses cannot be paid and the profit does not exist.

The actual percentage of profit to be made in each sale is a subject requiring careful consideration. A smaller percentage of profit is allowable on a staple article than on a specialty because the market has already been created for the staple. An investment of one hundred dollars in lamps may be made to turn over twelve times in a year, whereas the same investment in an electric range may turn over but twice. The secret of success in retailing is in carrying a small amount of stock and turning it over frequently. "Business is a tank of profits. Capital is a myriad of sponges. The sponges should be constantly put into the tank one at a time, then taken and squeezed dry."

Figuring stock turnovers is a complicated matter, because a part of the capital invested is released almost immediately and put back into additional stock and a part of it may be tied up for a long time. When capital is invested in stock and all the stock is sold the capital is turned over. But knowing the amount originally invested, the average stock on hand and the total amount of subsequent purchases, the dealer

can figure the number of times he has turned his capital by dividing the cost of goods sold during the year by the cost of the average stock carried. If a dealer finds that with an original investment of \$500 and a year's purchases totalling \$3,000 he has carried an average stock of \$500, his turnover is six times. Thus an electrical man who has \$10,000 worth of stock when he takes his inventory needs only to know the amount of his purchases and the average stock on hand to figure the number of his turnovers.

But in order to figure the number of turnovers on his gross business he must first allow for a profit on each turn of his capital before he can know the number of turnovers. Otherwise he is figuring without a starting-point. Suppose a small dealer has a gross business of \$10,000, has stock on hand worth \$1,000 and averaged the same amount of stock on hand during the year, how many times would he have turned over the stock investment of \$1,000? Do not jump at the conclusion that he turned it over ten times without first figuring his profit. Suppose that his selling price had been twice his cost price. One-half of \$10,000 is \$5,000. So the total stock investment represented in the \$10,000 gross was only \$5,000. Consequently his capital turned over five times. "You turn your capital over when you sell all the goods you have bought, regardless of the price at which the goods are sold."

Finally, neither the cost of the article and the expense of doing business are the only factors to be used in determining the selling price. The selling price should be that amount which the goods will command in the market,—how much the average customer will pay if he wants the article. Consequently it does not pay to handle an article for which the demand is so weak that it will not command at least the cost, the expense of doing business and a living profit.

AN ARTIFICIAL TRANSMISSION LINE

The long distance transmission of power is a question always of interest in the West where water power is so plentiful. It is often difficult to follow out the problems which arise in the actual working of the line in the field and to be able to bring this work into the laboratory is a real achievement.

In the September proceedings of the American Institute of Electrical Engineers, George H. Gray has interestingly set forth the design, construction and tests of an artificial power transmission line for the Telluride Power Company of Provo, Utah.

A description is given of an artificial power-transmission line which duplicates, in considerable detail, an actual transmission system. Each unit of the artificial line represents about ten miles of the actual line.

Methods are given of calculating the correct distribution of inductance between self and mutual, and of calculating the correct distribution of capacity between wire and wire, and wire and ground.

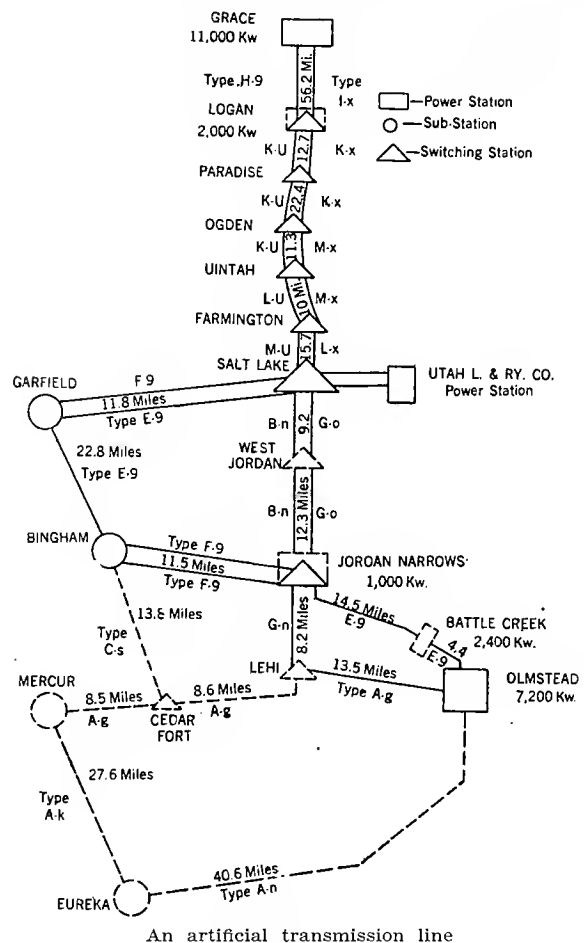
It is shown that this artificial system will duplicate very closely, even under extreme conditions of short circuits and grounds, many of the phenomena occurring on the actual system.

A description is given of some oscillographic tests, made on this line, of the magnitudes and phase relations of current and voltage at different points,

when the line was subjected to various types of short circuits and grounds.

The data are presented in the form of vector diagrams; one for each point of the line where readings were taken. In addition to the diagrams, arrow-headed lines are shown at each station. These indicate the magnitudes and directions of power flow for each phase (as shown by star-connected wattmeters) and the total power flow.

It is shown that the total power flow is not always toward the short circuit (or ground). Hence, two-



wattmeter principle relays will not always indicate toward the short circuit (or ground) and may sometimes operate the wrong switch.

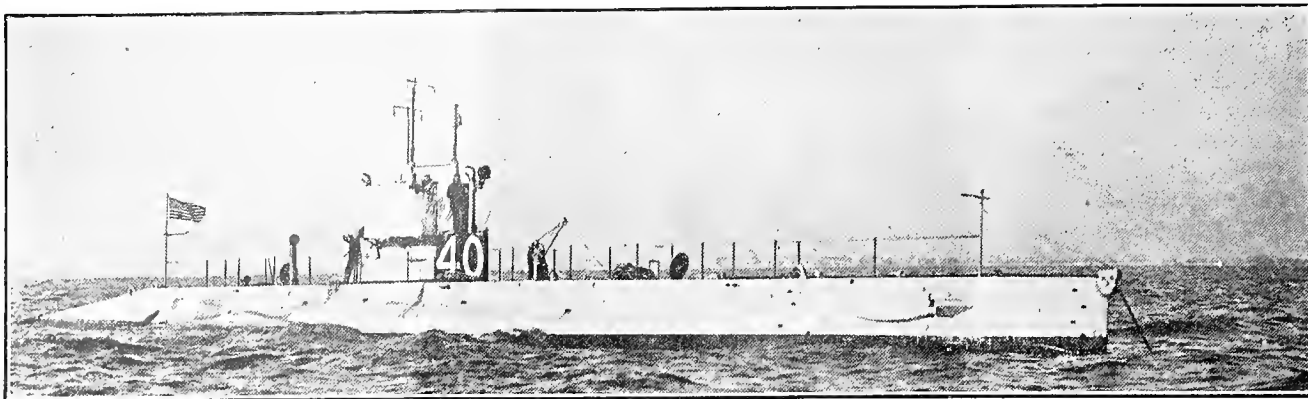
With a three-phase short circuit the direction of power flow for each phase, and consequently the direction of total power flow, is always toward the short circuit.

With a two-wire short circuit, if the phase rotation is A — B — C, and the short circuit is between wires B and C the power flow indication of the B phase wattmeter is, at all stations, toward the short circuit. The wattmeter for the other phases may indicate away from the short circuit.

A ground on a single wire does not appreciably alter the power flow indication of any of the wattmeters, if the neutral is ungrounded.

If the neutral is grounded, the power flow indication for the grounded phase is toward the ground at all points.

If two wires are grounded at the same time, with the neutral grounded, the power flow indications are practically the same as for the two-wire short circuit.



THE U. S. SUBMARINE L-1, ANCHORED IN HAMPTON ROADS

The displacement of German sea-going submarines of this character, which lately have ventured so far afield, is about 800 tons, their surface speed being 18 to 20 knots. These boats carry 10 or 12 torpedo tubes—four ahead and two astern—thus permitting of their discharge in quick succession if necessary. In these boats the breathed air is freed from dioxide by potash and is cooled and re-oxygenated by gas added to it from tanks of compressed air or oxygen. Copyright by International Film Service.

WAR PROBLEM FOR INVENTIVE SOLUTION

BY JOHN D. GALLOWAY

(Problems that are perplexing the National Research Council are herein made known in order that the inventive genius of the nation may set itself to work and assist the council in providing effective means for combating the new issues of the present world conflict. This article is abstracted from a paper presented by the author before a recent meeting of the San Francisco Section of the American Institute of Electrical Engineers.—The Editor.)

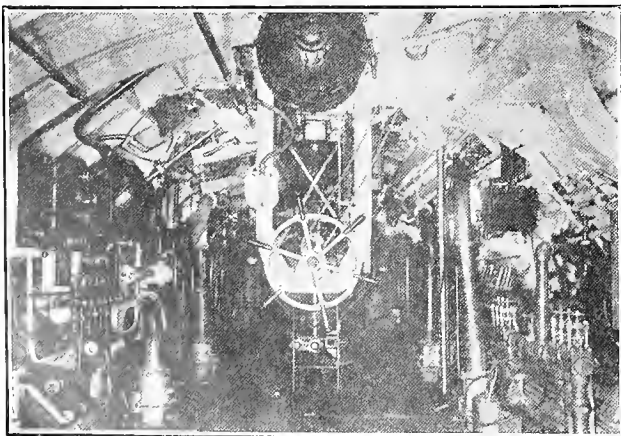
There exists a belief that American inventive genius will materially assist in determining the result of the war, and possibly it may. I have considerable faith in Americans but it does not go to the length of thinking that some unknown inventor will spring up from nowhere with a device for sinking submarines that will wipe the Germans out of existence. That idea prevails, however, and after the State Council of Defense had accumulated a collection of letters, drawings, etc. of various ideas, they asked the Pacific Research Council to form a committee to look them over. I suppose we have examined between fifty and one hundred suggestions, ideas, plans and models for war devices. They range from the absurd to the reasonable. One man suggests taking all the 2½ in. fire hose in the country, filling it with grain and towing it to Europe for our allies. If the tow-boat was lost, the hose would float around until picked up by another ship. Another man would load shells with honey bees, which when dropped on the Germans would make their lives unendurable. Still another

would station two ships, one at Norway and the other at England, furnish them with powerful electric appliances that would charge the intervening water, and electrocute the submarines. Most of the suggestions sent in are reasonable, but largely re-statements of things already known or tried out long ago. I have no idea that anything valuable will be offered, but in the hope that something good may come we look over everything and sometimes send it on to Washington, where a similar committee does the same work.

If Americans invent anything to finish the war it will be in some well-equipped laboratory where men of scientific training are at work. Such work is being done in San Francisco, but I refrain from further information as the gentleman at the head of this laboratory is here tonight to tell his own story.

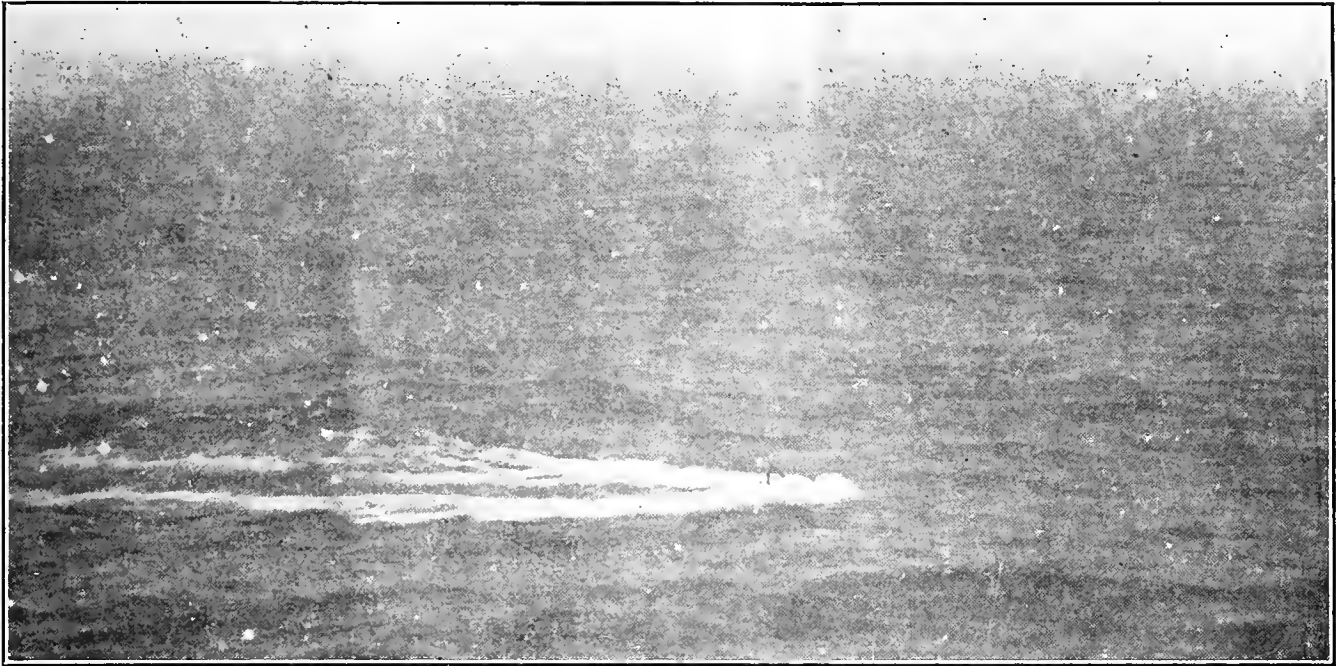
This brings up another phase of the subject of inventions, and that is, a knowledge of the problems to be solved. Very little information has been given out and so, to a certain extent, inventors are working in the dark. The following is a list of problems requiring solution sent to us by the National Research Council advising the National Council of Defense:

- (1) A pipe-pushing device which will ensure the maintenance of the required direction.
- (2) A substitute for lead antimony alloy for shrapnel bullets, the alloy consisting of 7 parts of lead and 1 of antimony and the number of bullets being 41 to the pound.
- (3) A means of dissipating gas clouds.
- (4) Predicting apparatus for Anti-Aircraft gunnery.
- (5) Means for removing wire entanglements otherwise than by firing at them.
- (6) A short base height-finder for anti-aircraft use.
- (7) Trench signalling apparatus for signalling back to the trenches from an advanced position.
- (8) Message carrying rockets.
- (9) Trench signalling apparatus for the transmission of messages which cannot be tapped.
- (10) Apparatus for detecting the approach of air-craft by sound.



INTERIOR VIEW OF A TYPICAL SUBMARINE

Note the complicated equipment, electrical and otherwise, that is installed in the modern submarine. It is said that a whole year is necessary to properly train a crew to operate the submarine. Copyright by International Film Service.



A PERISCOPE JUST BEFORE SUBMERGING

This remarkable view of the periscope of a German submarine was taken during the attack on the American transports carrying Pershing's expedition to France. According to Admiral Gleaves' report, submarines were encountered on June 26 about midday and again on the morning of June 28. They were driven off both times. This picture was taken from the deck of one of the transports (name suppressed by censor) during the encounter. The submarine was fired on by the naval gun crew as she submerged. Copyright by International Film Service.

(11) Apparatus for the acoustic detection of hostile mining activities.

(12) Armor-piercing bullet for use against tanks.

On receipt of this list, I wrote Dr. Millikan in Washington, asking if it was not possible to send out more detailed information regarding the problems with some statement as to what had already been done. He replied that nothing farther was available, but later Dr. Durand sent us a summary of available information upon the submarine and the torpedo. As these matters are of interest, I have abstracted some parts of these papers, even at the risk of giving information already well known. After tracing the history of the invention, the paper states that the most effective type of modern war submarine has a displacement of 1200 to 1500 tons, a length under 300 feet and a surface speed of over 20 knots.

Larger war submarines, with a length of 300 to 400 feet, are inadvisable because they would be too slow in submerging and when submerging, except at very small angles of inclination, they would run the risk of reaching dangerous depths before they could be controlled—dangerous depths being those at which the nose of the boat may strike bottom or the hull be subjected to crushing stresses, due to a water pressure beyond the strength of the boat.

No submarines have been built to accompany fleets on account of a lack of speed. A speed much greater than 20 knots an hour is necessary. In the United States, the surface displacement is customarily given for submarines; the 1915 type shows a surface displacement of 1200 tons, a surface speed of 20 knots and a submerged speed of $11\frac{1}{2}$ knots. Many of our boats are now capable of making a cruise of about 4500 miles.

The 1915 type is submerged by the filling of water tanks and the operation of two pairs of horizontal or diving rudders, one pair at the bow and the other at the stern. The hull is divided horizontally into nine

main watertight compartments. Forward at the bow are the water ballast tanks through which are carried four torpedo tubes, two on the port and two on the starboard bow. Aft of this is the torpedo compartment. The next compartment forms the officers' quarters, and aft of this comes the crew's quarters with storage batteries below deck. Then follows a smaller compartment, the upper part of which is the wireless operator's room, and the lower half is given up to cold storage. Next, at about the midlength of the boat, is the central operating compartment with the conning tower. Aft of this comes another compartment, containing quarters for the crew, and below the floor, as in the case of the other crew's quarters, are storage batteries. Then follows the engine room containing two 12-cylinder engines. In the next compartment are electric motors, two on each shaft; and in this room also is located various auxiliary machinery. The last compartment is given up to water ballast.

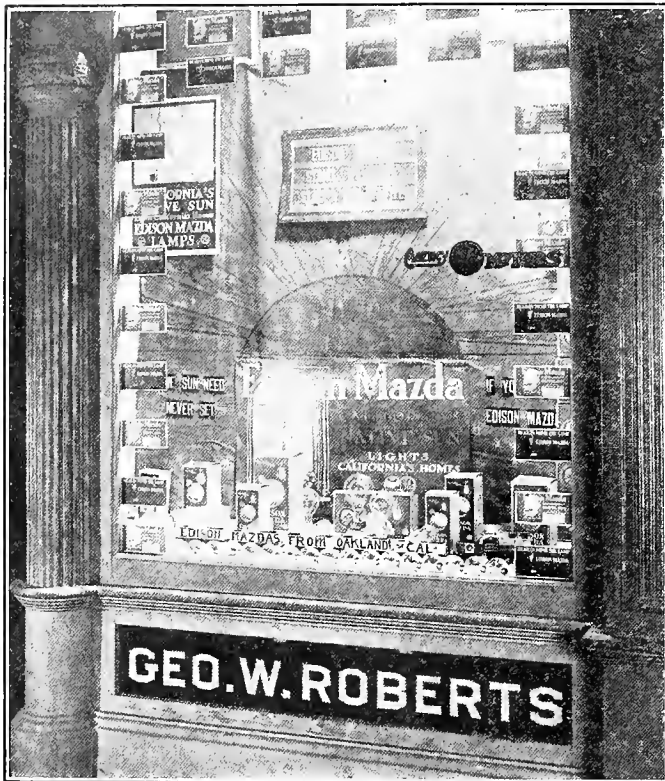
In addition to the four fixed torpedo tubes, there are four tubes arranged in pairs on two movable mounts, which are carried above the main hull and within the false superstructure. These are capable of being fired through a wide arc on either bow.

The 1915 type of German submarine used surface propelling machinery, consisting of two Diesel engines, each developing about 900 to 950 brake horsepower. These engines work on the two-cycle principle, which implies that there is one working stroke per cylinder for every revolution and involves the introduction of scavenging air pumps for supplying air for the working strokes and driving out the exhaust gases after combustion and expansion. In Diesel engines high pressure air compressors are also required to supply compressed air at about 750 to 1000 pounds per square inch, for injecting the fuel into the working cylinders after compression.

WESTERN WINDOWS THAT WIN

("Example is more powerful than precept." To present new ideas in show window display to electrical dealers throughout the West actual displays will be illustrated and described in this department from time to time. The prize winners in the "California Native Sun" contest conducted by the Edison Lamp Works are shown herewith.—The Editor.)

Some excellent examples of effective show window displays were brought out in a contest conducted in California under the direction of Frank D. Fagan, Pacific Coast manager of the General Electric Co., during September, 1915. As the cash prizes totalled \$260 the response was wide-spread throughout the state.



First Prize Winner—Geo. A. Roberts, Marysville

A simple, well-balanced display with strong selling argument in well displayed lettering. It combines human interest, novelty and artistic arrangement in a small window.

The object of the displays was to tie in the fact that the lamps are made in California with the spirit engendered by the celebration of Admission day on September 9th and during the week following. Around the central idea that the Edison lamp is a "California Native Sun" was to be built up a structure typifying California conditions.

Each dealer entering the contest was furnished with material and suggestions for a window trim, but was encouraged to use originality as far as possible. One suggestion was a Mission town, surmounted by a cross and supporting bells. The town was to be built up of lamp cartons and the bells and cross cut from white cardboard, as was also the painted orange-colored sun.

Another suggestion called for an arbor made up of lamp cartons held together by inserting the flaps of one into the other and fastening them with pins. In the background was shown a sun with a Mazda lamp as its center and prominently displayed were posters bearing the message, "California's Native Sun Lights California Homes." Supplementary material in the way of blotters, automobile banners and

cuts for newspaper advertising were also furnished so as to attract favorable attention to the dealer's store, thus increasing lamp as well as other sales.

Contestants were advised that merit, not size, would decide the winning windows. The effectiveness of a single central idea simply presented was emphasized and suggestions made to provide some moving object, such as a fan-blown flag, as a means for attracting attention. The premium placed upon originality was also impressed on their minds by means of the literature sent out in advance. They were notified that the contest would be judged from photographs and brief descriptions submitted prior to September 29th.

The judges of the contest were Mr. Allan, secretary of the Western Furniture Dealers' Association, H. C. Reid, president of the California Association of Electrical Contractors & Dealers, and A. H. Halloran of the Journal of Electricity. In determining the prize winners the several criteria set by the company were kept in mind as well as the selling power, novelty, balance, lighting, artistry, and judicious use of show cards.

The accompanying illustrations show the prize winners. The first prize of \$100 was won by Geo. W. Roberts of Marysville, the second of \$75 by Kimball Electric of Oakland, the third of \$50 by Hanbridge Electric Co. of San Francisco, the fourth of \$25 by the Valley Electric Supply Co. of Fresno and the fifth of \$10 by the Levy Electric Co. of San Francisco.

The background of Mr. Roberts' window was painted to represent the setting sun, with the wording, "The Sun Need Never Set If You Use Edison Mazdas." The window display material was used to convey the idea that Edison Mazdas are California's Native Sun, while the moving train brings out the fact that the Oakland factory is busy making delivery of Edison Mazdas, as each car carries a lamp. In the opinion of the judges this window would probably sell more lamps, other conditions being equal, as it



Second Prize Winner—Kimball Electric Co., Oakland

A window embodying novel ideas effectively carried out. It invites attention but is lacking in direct selling arguments.

gave the price of a carton in a prominent position and carried an active buying suggestion. The moving train of lamps embodies a feature of strong human



Third Prize Winner—Hanbridge Electric Co., San Francisco
An artistic effect obtained with small cost. Increased lamp sales 25 per cent in one week.

interest, the display is simple and well-balanced and the use of well-worded cards should help in selling lamps.

The central feature of the Kimball Electric Co. window was a battle-ship fabricated from Edison Mazda lamps, the hull being made of tubular lamps wired on a cardboard frame, the smoke-stack of heater bulbs and the guns of tubular lamps made of paper. The bear at the side held the ribbons by which the ship was fastened. Various types of lamps were well-displayed in the foreground. This window has good attention-compelling value but does not carry quite as strong a selling argument as does the window of the first prize.

The Hanbridge Electric Co. greatly improved on the suggestion of a California mission by clever elaboration. The cartons of which it was constructed were given the yellow tint of adobe while the doorway and window sills were tinted reddish brown. A

blue cardboard background carried a yellow cardboard sun and a giant lamp as well as appropriate signs in 4-in. white letters. Grass sod, geraniums and palms gave an appropriate setting for the mission and the lamps which varied in size from flashlights to 1000 watt mazdas. The total cost of this display to the contractor was \$2.20. During the first week sales increased 25% as a result of the display.

For originality of conception and cleverness of execution the window of the Valley Electrical Supply Co. is deserving of special mention. The display of harvest products is particularly appropriate in an agricultural community. In the words of Stuart Rogers, who designed and built this window:

"In the center we have 'A Winning Wonder.'

"The setting Sun on yonder hills,
Which gives the days their light;
Its work is done, its toil is o'er,
It's falling fast in downward flight;
You step inside and buy the Sun,
That drives away the falling night.

The setting sun in the evening scene is worked by the sign flasher, giving the disappearing effect, and then you will see a 1000 watt light in the center of the window, below the words 'California Edison



Fifth Prize Winner—Levy Electric Co., San Francisco
An artistic arrangement, novel in design, but lacking balance. Descriptive price tags are a good feature.

Mazda.' That stays on for a few moments and then the red, white and blue flashes its colors on the scene. The large sign at the top of the window, 'California Native Sun,' is in red, white and blue paint."

"California Reaping Her Harvest From Her Native 'Sun,' the keynote of the Levy Electrical Co. display, brings out the fact in an attention-compelling manner that the Edison mazda lamp is a California product. The state colors of blue and gold were used throughout. The lattice work was finished off with California poppies, oak leaves, and fruit and flower lamps. The sheaves of grain conveyed the idea of "California Reaping Her Harvest" from the Edison mazda lamp. Blue and gold streamers ran from the words "California and Native 'Sun,'" in the large card to the 750 watt nitrogen lamp. The signs were arranged to read consecutively and bring out "Home Industry" to the reader. Between the two lower signs was a row of lamps comprising all the standard sizes with a price and descriptive tag attached. To the extreme right was a chapel with a 300 watt nitrogen lamp representing a bell which is pulled by a man below—a gold cord suspending for a rope.



Fourth Prize Winner—Valley Electrical Supply Co., Fresno
Great originality in arrangement and wording of placards. Special appeal to those interested in home products.

SELLING ELECTRIC WASHING MACHINES

BY A. E. KUHNHAUSEN

(The department store may be made an effective medium in selling appliances to women. The details of a successful campaign conducted along these lines in Oregon are given in this article. The author is sales manager of the Lipman-Wolf Company of Portland, Oregon.—The Editor.)

When it is possible to sell 100 electric washing machines in 6 weeks' time through a department store, it is of general interest to the electrical fraternity to know how it was done.

The machine was a moderate priced machine, retailing at \$65.00, and was sold at \$1.00 down and \$1.00 per week, being placed on a thirty day trial. If at the end of that time it did not prove satisfactory the machine could be returned and the money would be refunded. Out of the first one hundred machines sold not a single one had to be taken back.

The writer conceived the idea that a campaign for selling electric washing machines could be conducted with great success and at a small expense through the medium of a department store, for the following reasons:

(1) The general public, especially the women in the larger cities, are accustomed to buying from department stores, and also to looking through the department store advertisements which appear in the daily papers.

(2) A small advertisement in the columns devoted to the department stores has a greater drawing power than the small-sized ad. for a local electrical contractor or dealer.

(3) The location of a department store is always the correct location for merchandising.

Therefore in line with these reasons the campaign was started by a special section in the department store ad. page in the daily press. Also a window display was arranged which proved to be most effective. This consisted of an actual demonstration of the electric washing machine by a woman on one side of the window space, while on the other side another woman washed in the old-fashioned way. The window also contained a number of suggestive cards, such as "\$1.00 down and \$1.00 a week will place this wonderful machine in your home"; "The machine will pay for itself"; "Make arrangements for a free demonstration in your home"; "It costs only two cents (2c) an hour to operate the washer," etc. Another card directed the interested parties to the first floor where a first-class salesman explained the machine and made appointments for free demonstrations in their respective homes.

It was found that nearly all classes of people bought machines at the above mentioned price. The washing machine of this price is a dolly-type of washer, the machinery being of necessity as simple as possible, so that it will not give trouble to the operator.

These 100 washing machines were sold in six weeks' time by one salesman and one demonstrator. The man who demonstrated in the home thoroughly understood the machine and all possible tricks for washing clothes and at the same time had the necessary ability to close sales.

Prior to visiting the home, the demonstrator would ask the housewife to soak the clothes over night in cold water, which made the washing very much easier and quicker. Upon his arrival in the home he would give complete instructions how to operate the machine, how to take care of it, how to oil it, and how to wash and wring the clothes. In order that the customer would not catch her fingers in the wringer, he explained to her how to handle the clothes in order to avoid getting injured.

In every case, the demonstrator would wash and wring one tub full of clothes and would then let the customer wash and wring another under his supervision, so that by the time her washing was complete she would thoroughly understand all principles in the handling of the machine.

The great secret of keeping electric washing machines sold is the ability to give proper service to the customer.

The practice of calling upon each customer about one week after purchase and demonstration, to ascertain if she had had any difficulties with the first washing she attempted after the demonstration, was found to give excellent results. If a complaint was made, it was taken care of by the man who demonstrated the washer, as it was found that the housewife already had confidence in him.

The few complaints received were adjusted as soon as possible after they were received. They generally consisted of very minor troubles, such as getting the clothes stuck in the wringer or the blowing of fuses. It was found by actual experience that when first-class service is given customers, that each satisfied one will make from three to five additional sales for the store.

At this date the machines are still selling at the same rate as for the first 6 weeks and this with only newspaper ads. and the personal work of the above mentioned sales force.

THE GOVERNMENT DOES ELECTRICAL ADVERTISING

The slogan, "Food Will Win the War—Don't Waste It," is being blazoned in every large city in the country on immense signs on public buildings, according to the Signs of the Times. These signs are uniform in general design, in paint for day time display and illuminated by electric light for night.

Advertising companies have patriotically contributed their resources without charge to install the signs. The Treasury Department has granted the right to use the exteriors of Federal premises in the principal cities, including post office buildings, which are under its charge. Mayors and municipal councils are permitting the messages to be placed on city halls. Electric light companies are gratuitously furnishing and installing the bulbs and supplying the power.

EFFECT OF LOSSES BY FORTUITOUS EVENTS

BY C. E. GRUNSKY

(In discussing losses resulting from fortuitous events of a character against which protection by insurance is not obtainable, the author sets forth in this article many new ideas for consideration by valuation engineers. This discussion was largely brought out by the author in his testimony in the San Francisco Gas & Electric rate-case now on trial in San Francisco before the Master in Chancery in that city.—The Editor.)

Losses of magnitude which result from floods, earthquakes, volcanic eruptions and the like and in general, losses against which the owner can not insure, belong to a class of sacrifices, which like those due to obsolescence should be made good to the owner of the utility after the event, by the public, that is to say, by the rate-payers. Such losses can not be forecast. They should not fall entirely on the owner of the utility. In some fashion and to a fair extent, they should, in the course of time, be amortized out of earnings. As a rule no provision for other than ordinary risks is made in the allowed rate of return. Consequently, after a catastrophe, for which the owner is not responsible, but which entails a large investment of new capital to rehabilitate a public utility plant, there should be some provisions for amortizing the loss. It will, in such event, be better to let the amortization take place within a reasonable time rather than to carry an equivalent sum in the rate-base as though it were a permanent though unproductive, interest-bearing investment.

It will perhaps be claimed, by some, that such losses should not be differentiated from the ordinary losses due to unforeseen causes, and that whatever hazard is involved in any enterprise has unqualifiedly been assumed by the owner of the utility. Under such a theory the allowance for hazard should at all times be liberal enough to compensate the owner for the chance which he takes of at some time suffering material loss. He would be compelled to take the gambler's chance and the rate-payer should stand the higher rate. Under such a practice there would be an owner here and there who would suffer large loss, while the great majority of owners, escaping the great catastrophes, would get what really should be paid, in the exceptional case, to the unfortunate owner. Under such a treatment of this matter, the tax for the risk would fall upon those who are paying rates before a catastrophe occurs, as well as upon those who receive service from the rehabilitated works. The more logical procedure would be to relieve the rate-payers from the burden of making the inadequate provision for catastrophes which may never occur and letting the loss that actually results from a catastrophe be met out of future earnings. The usual provision for meeting losses which result from such fortuitous events as are here under discussion, is inadequate. The owner does not, as in the case of losses which must be made good by assurance companies, get the full benefit of the allowance for risk which is distributed in small measure or is at least supposed to be distributed among all public utility owners and is supposed to be collected in the earnings. The owner's share in this risk allowance is only a proportionate one while the loss, when it occurs, can not be distributed to the other utilities of the country which escape

such loss, but falls in its entirety upon the one utility that may be affected thereby.

In recognition of the fact that most utilities escape such losses, the usual allowance in the public utility rates for the element of risk is small and probably in most cases negligible. The allowance for management, for business hazards, together with the allowance for participation in the general prosperity of the country, in short the profit allowance, would probably in few, if any cases, be materially reduced, if this element of risk were entirely eliminated.

In all cases in which this interpretation of the present day procedure is substantially true, it would be unfair to an owner whose public utility plant sustains material damage by flood, by earthquake or by other fortuitous event, against which insurance is impossible, to let the entire loss fall upon him without recourse. That such losses should in some way ultimately fall upon those who are served by the utility seems self-evident. The most equitable procedure would be to let them be borne by the rate-payers future. But as they can not be foreseen the practical alternative would seem to be to let them fall in the before the event as well as by the rate-payers of the future as would be the case if the utility were publicly and not privately owned.

In the case of a business not subject to regulation the opportunity to make up for past losses exists if larger profits can be made by charging what the traffic will bear. Owners of public utilities should be allowed to recoup their losses, if they can do so without charging rates unreasonably high.

ELECTRICITY IN HAWAII

Electric light is used in the larger cities, on each of the islands, such as Honolulu, island of Oahu; Hilo, island of Hawaii; Lihue, island of Kauai; and Wailuku and Lahaina, island of Maui. Each of the smaller towns throughout the islands happens to be the headquarters of a sugar-cane plantation, and as the mills all employ electricity for power and light in the plants, while offices and homes also are served, the service is extended to the small towns.

In Honolulu there is one electric-lighting corporation and a Territorial Government light plant, the latter being in Nuuanu Valley, where power is generated by water supply from reservoirs passing over wheels. This current lights most of the streets of the city and also furnishes light for Government buildings. Many of the large buildings in Honolulu have their own electrical plants, as well as water plants supplied by artesian wells on the premises.

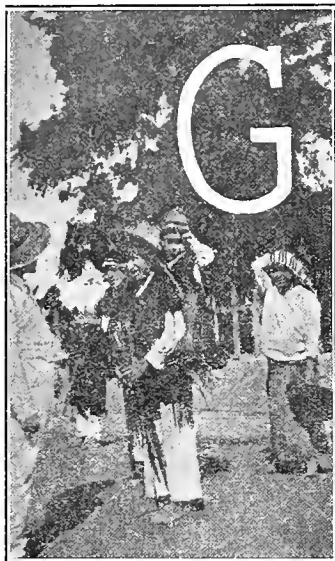
One electric trolley company in Honolulu operates an up-to-date line throughout every part of the city and suburbs. The cars were made in Philadelphia and St. Louis. A street railway system is to be operated in Hilo, a franchise having been granted for that purpose.

SHORT JOURNEYS IN PACIFIC LANDS

(From the "cow to the cup" method in Guatemala to a meal at one of the luxuriously appointed hostels of Hawaii is a far cry, but the engineering traveller must be prepared to take things as they come. Reports from Alaska and from Russia indicate the growing opportunities for the electrical industry which are opening up there.—The Editor.)

A COMMERCIAL AND ENGINEERING TRAVELER IN GUATEMALA

BY J. W. FINCH



A Street Scene in Guatemala

GUATEMALA, the capital of the Republic of the same name, is connected with both the Atlantic and Pacific coasts by rail and while the city is not at all modern, the traveler can find there, comfortable lodgings, indifferent food and some amusement. However, to really know Guatemala and her people, their customs and their mode of living, one must travel through the interior.

The 100,000 inhabitants of Guatemala City include people of many classes and not a small proportion of them are foreign to the country. The most progressive merchants and those enjoying the largest volume of business are invariably foreigners. There are the legations of the many countries of the world represented here, with their ministers of various and sundry caliber, the ministers' secretaries and clerks and the many consulates with their organizations sometimes consisting of the consul only, but more often with a vice-consul and one or two clerks. The small merchant is usually a Guatemalteco and his establishment may consist of a fairly decent looking store or a stand on the street with all manner of intermediate stores. Next we have the Indian merchants who sell the wares of the country. Some of the Indians will be peddlers carrying their wares through the streets on their heads or backs, others will spread their wares out on the streets, or on the sidewalks, wherever the room will permit. They sit on their heels or squat, beside their shops "al fresco," and patiently await trade. The open air "restaurant" with its charcoal fire in a five gallon kerosene can will serve a very satisfactory meal, from the Indian's point of view, for from 12 to 16 reales (about $3\frac{3}{4}$ to 5 cents American gold). Their plates consist of a fresh green leaf and their cups usually a small gourd. Some of these "restaurants" are slightly more modern and up-to-date and serve their patrons in a white enamel bowl or plate. If you wish to regale yourself with a glass of nice fresh cow's milk, there are "lecherias de pie" where if you bring your cup or glass you can watch the "lechero" draw the glass of milk directly from the cow. You are thus assured, even though the vendor does not keep a refrigerator

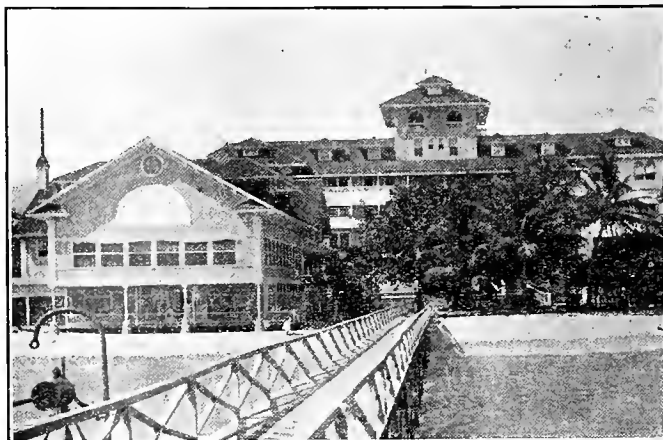
that your milk is fresh. But, we are going into the interior and we must start or we will be at the end of our space.

A commercial traveler covering the "Occidente," as all the country west of the capital is called, will leave the city in the early morning by the narrow gauge train of the Ferrocarril Internacional de Central America. This railway system is owned principally, and operated by, American interests and the higher resident managing officials are Americans. A reasonably accurate schedule is maintained and a first class ticket entitles the holder to all the comforts of a cane-upholstered seat in a car which very probably had served a useful term on some one of our Western narrow gauge railroads. The one in which I am riding, while this is being written, was manufactured in Oakland, California, as indicated by the maker's name on the door sill.

WATERING PLACES FOR THE ENGINEER TOURING THE ORIENT

The term "watering places" as applied to the Far East as a nomenclature for the well equipped hostels there to be found, is well taken and then again it isn't. So far as the beverages that may be obtained are concerned, water usually comes last on the list, but on the other hand so far as keeping one's equilibrium is concerned in a hot, torpid, humid climate, total abstinence is absolutely imperative.

Be this as it may, the engineer who takes a farewell dinner at the Palace or St. Francis in San Francisco immediately before embarking for the Orient, and who expects to bid adieu to carefully appointed menus and well equipped hostels for many a day, finds himself most agreeably disappointed, as he visits in turn Honolulu, Yokohama, Tokyo, Kobe, Kyoto,



THE MOANA HOTEL AT HONOLULU

In full view of the many colored tints of the coral sea and of the native surf riders excitingly being hurled shoreward, this hostelry presents many surprises in appointments and entertainment not to be found in our great American hotels of this nature.

Nagasaki, Manila, Hong Kong, Shanghai, Peking and other great cities of the Far East.

General Comparisons with Hotels of Southern Europe.—Each in its separate and unique way springs new charms to the traveller's keen desire for something in keeping with the change in national life and environment, and yet at the same time bears sufficient relation to the accustomed American and European methods, as not to frighten the possibilities of perfect action of one's digestive apparatus. Tourists returning from Italy, Greece, Palestine, and Egypt report that this state of affairs is no longer true in that section of the world. Due to the schools and colleges for the training of hotel domestics in Germany, a horde of their graduates have overrun those countries. While their cuisine is excellent and the accommodations usually are beyond reproach, still the eternal "sameness" one experiences from port to port spoils the former charm they possessed.

Hotels of Honolulu are Tantalizing in Their Balmy Beauty.—In the Far East, however, no such dominating influence is felt. As soon as one catches sight of the beautiful Moana and Alexander Young Hotels, as he is about to complete his six day trip from San Francisco to Honolulu, the charm is felt.

The Hawaiian youths—brawny and brown—who swim out to give you welcome and incidentally dive for any coin you may toss to them, act as a kind of new and fascinating appetizer in this land of soft and soothing scenery.

The hotels of Honolulu are located near the enchanting Waikiki Beach and from the beautifully appointed dining room of the Moana Hotel, one may look out upon the alluring coral ocean with its tantalizing greens, blues and purples, to see the native surf rider triumphantly ride the waves into shore.

The service is excellent, the music soothing, the curios to be purchased in the halls of rare taste and reasonable price, and withal one leaves again upon his departing steamer with considerable regret, for there comes to his consciousness a fear that surely now the last farewell has been said to appetizing plate and bed of comfort for many a day.

Only to be fooled again, however, for his next stop is to be at the delightful Grand Hotel of Yokohama.

ELECTRICITY IN THE MINES OF ALASKA

BY ALLEN E. RANSON

Mr. A. L. McConnell, formerly of the Seward Peninsula Light and Power Company of Nome, has taken over the management of the Cordova Power Company and they are making many extensive improvements, adding a new 150 kva. 2200-volt generator which will be driven by a Pelton Water Wheel.

Mr. Angus MacDougal is the resident manager and original locator of the Chitina Kuskulana Copper Company and they have installed a 100 h.p. steam plant on the banks of the Kuskulana, just below the glacier. They have a most complete plant supplied through A. H. Cox & Company of Seattle, consisting of a 100 h.p. wood-burning boiler, a 100 h.p. Erie Ball engine belted to a 62½ kva. G. E. 3-phase, 60 cycle, 2200-volt alternator, switchboard, etc. They

have built a three-mile transmission line of stranded galvanized steel cable which runs up the mountain below the opening of the ore tunnel, about 1500 feet above the river. Here they have installed an Ingersoll Rand Air Compressor driven by a 50 h.p. motor.

They are installing a new 165 h.p. Diesel engine and 100 k.m. a.c. generating plant at Ellamar. The mine is owned by Mr. F. M. Jordan of Seattle and is a most successful copper property.

I note that many properties are installing Diesel fuel-oil engines. Mr. Hancock, manager of the Mother Lode Copper Mine, has a 150 h.p. and the Kennett Copper Company at the mine has one. Grassby is putting in a new 200 h.p. and all along the line it seems to be the favorite auxiliary.

GROWTH OF ENGINEERING AND COMMERCIAL RELATIONS WITH RUSSIA

The following table shows the growth of the United States' export to Russia before the war, according to United States statistics:

U. S. Yearly Average Export to Russia (In Thousands of Dollars)	1891- 1895	1896- 1900	1901- 1905	1906- 1910	1911- 1913
Cotton (raw).....	4,811.0	3,006.0	5,909.0	5,478.0	5,685.5
Agricultural machinery and implements).....	323.4	684.4	3,000.0	5,178.0	1,322.7
Copper (unmanufactured)		822.0	1,632.0	1,112.0	1,322.7
Wheat flour.....	136.0	395.0	773.0	1,895.0	3,360.0*
Leather (prepared).....		1.3	1.8	162.0	1,075.3**
Machine oil and paraffin	1.0	9.1	71.1	151.2	232.8**
Rosin	241.0	285.0	275.0	320.0	737.0
Typewriters		126.1	172.7	367.8	846.9
Cash Registers.....			26.0	124.0	249.4**
Sewing machines.....		28.1	36.3	232.9	768.3**
Scales of every kind.....	29.4	70.5	54.0	57.0	58.6**
Twine, cord, etc.....	11.7	28.5	299.9	753.0	1,646.4

*This is the figure for 1911. No figures are given for 1912 or 1913.

**Figures for 1913.

The figures just quoted, together with the figures quoted previously regarding Russia's export to the United States, show quite clearly along what lines the American-Russian trade rapprochement had begun to develop even before the war, before the remarkable changes produced in the economic situation of both countries. Russia supplies and will supply this country with raw materials of the highest quality. The amount of Russian raw materials brought to this country is much greater than can be seen from Russian or even United States statistics. By creating direct connections with Russia, by careful study of the conditions of the Russian market, by an active trade policy, the amount of raw materials brought to the United States from Russia can be multiplied many times to the benefit of both countries.

On the other hand, the United States supplied and will supply Russia with all kinds of machinery, with all kinds of products that presuppose a highly developed industrial culture. The possibilities of such trade, very apparent before the war, are emphasized by the events of the war. Germany, which in 1913 held 52.6 per cent of all Russia's import, is now withdrawn from the field. By proper and active policy, the United States can now not only develop that line of her trade with Russia that showed a natural tendency to develop before the war, but even introduce into the Russian market a full line of goods never before brought into Russia from the United States.

RECENT ADVANCES IN WESTERN WATER LAW

DEPARTMENT CONDUCTED BY A. E. CHANDLER

(This decision settles the long standing controversy between the Silver Lake Power & Irrigation Co., one of the projects of the Nevada-California Electric Corporation, and the city of Los Angeles, in favor of the city. So succinct is the wording and so clean the statement of principles that the decision is printed in its entirety. It was written by J. Henshaw and unanimously concurred in by all the justices of the California Supreme Court.—The Editor.)

SILVER LAKE—LOS ANGELES AQUEDUCT DECISION

Respondent's predecessors in interest first conceived the plan of utilizing the waters of Owens river and of Rock Creek, one of its tributaries, for irrigation and for the development of hydro-electric energy. They made locations upon the river and creek for these purposes. They began their work under these locations and they prosecuted this work until it was interrupted and suspended by withdrawal orders of the government of the United States. Under the compulsion of these withdrawal orders the predecessors in interest of respondent ceased work. These withdrawal orders were temporary in character and made in conformity with the law in contemplation that the United States government might itself impound these waters and devote them to purposes of irrigation for the benefit of the valley lands lying under them. This contemplated reclamation scheme of the federal government was abandoned. Before the formal order of abandonment was actually made it became apparent that the government would not proceed with its plan, and respondent's predecessors in interest resumed work. The work which they did before the withdrawal of these lands by the government was performed at least two years before the city of Los Angeles ever contemplated using the water of Owens river or of its tributary, Rock creek, for any purpose whatever. During the period of time when the lands lay under the orders of withdrawal Congress passed a certain act, giving the city of Los Angeles, upon conditions, a preferential right to purchase some of the withdrawn lands. The orders of withdrawal, to which reference has been made, were first, the order of July 24th and 27th, 1903, under which all of the lands on which the notices of appropriation by respondent's predecessors in interest had been posted, were temporarily withdrawn, together with large tracts of land for use as a reservoir site in connection with the contemplated government project. On August 24th and 25th, 1903, all the lands upon which it was proposed by respondent's predecessors in interest to put the water for agricultural purposes were temporarily withdrawn from all forms of entry except homesteads. On January 1, 1905, all the lands in the Owens river gorge, which lands lie below the proposed reservoir site, were likewise withdrawn for use in connection with the government project. These orders of withdrawal were formally vacated on July 12, 1907.

Before June 30, 1906, but long after the initiation by posting and recording of the rights of plaintiff's predecessors in interest, and long after their first work under those rights had actually been prosecuted, the city of Los Angeles conceived the idea of devoting

to its own uses for municipal purposes the waters of Owens river. On the last mentioned date and during the period of the operation of the orders of withdrawal above referred to, Congress passed an act (34 U. S. Stats. at Large, p. 801), granting to the city of Los Angeles necessary rights of way over the public lands in certain named counties "for the purpose of constructing, operating and maintaining canals," etc., in short, for all legitimate purposes in connection with the proposed conduct of the water of Owens river to the city of Los Angeles, and for the additional purpose of maintaining power and electric plants. This grant was to take effect "whenever said city shall have filed, as hereinafter provided, and the same shall have been approved by the Secretary of the Interior, a map or maps showing the boundaries, locations and extent of said proposed rights of way." It was required that the city should file such maps within one year after the passage of the act, and should do no work until the maps had been filed and approved. The rights of way thus tendered by grant were declared not to be effective "over any land upon which homestead, mining or other existing valid claims had been filed or made until the city of Los Angeles shall have acquired title thereto and made just compensation therefor." Still further and with particularity it was declared that the act should not "affect the adjudication of any pending applications for rights of way by the owner or owners of existing water rights, and that no private right, title, interest or claim of any person, persons or corporation in or to any of the lands traversed by or embraced in said right of way shall be interfered with or abridged." Also the act declared:

"That in the event that the Secretary of the Interior shall abandon the project known as the Owens river project for the irrigation of lands in Inyo county, California, under the act of June seventeenth, nineteen hundred and two, the city of Los Angeles, in said State, is to pay to the Secretary of the Interior, for the account of the reclamation fund established by said act, the amount expended for preliminary surveys, examinations and river measurements, not exceeding fourteen thousand dollars, and in consideration of said payment the said city of Los Angeles is to have the benefit of the use of the maps and field notes resulting from said surveys, examinations, and river measurements, and the preference right to acquire at any time within three years from the approval of this act any lands now reserved by the United States under the terms of said reclamation act in connection with said project, necessary for storage or right of way purposes, upon filing with the register and receiver of the land office in the land district where any such lands sought to be acquired are situated a map showing the lands to be acquired, and upon the approval of said map or maps by the Secretary of the Interior and upon payment of one dollar and twenty-five cents per acre to the receiver of said land office title to said land so reserved and filed on shall vest in said city of Los Angeles."

It was the language of this act, with other circumstances not necessary to particularize, which conveyed the knowledge that the government would abandon its proposed reclamation project. Thereupon respondent's predecessors in interest in June, 1906, resumed work under their notices and continued this work (interrupted only by the snows of winter) until shortly after the commencement of this action on July 15, 1907. At that time there was in the codes of this state a section (Civ. Code, sec. 1416) providing in effect that where litigation becomes necessary under such enterprises as this to acquire land or rights, "then the party so appropriating, or his assigns, shall have sixty days after the determination of legal proceedings by final judgment in which to commence to excavate or construct the works in which he intends to divert the water." Respondent and its representatives ceased work under the guaranty of protection extended by this law. Its provisions in this regard, however, were repealed, at least by implication, by section 4 of the Water Power Act of April 8, 1911 (Stats. 1911, p. 813.) Following the passage of this act, on or about August 1, 1911, respondent resumed work and continued this work until the date of the trial of this action. This latter work was in part actual construction work and in part was surveying.

In the action which it brought, this respondent set up its asserted rights to the waters of these streams for the purpose of irrigation as well as for the purpose of developing hydroelectric energy. In this another corporation was interested. There resulted a tripartite agreement between these appellants and respondent and the third corporation, under which the asserted right to the use of the water for purposes of irrigation was abandoned and those rights conveyed to the city of Los Angeles, leaving in issue the question whose was the right to use these waters for the generation of electricity. With the litigation thus restricted trial was had before a jury, to which twelve special questions were submitted. One and all the jury's answers favored plaintiff's contentions. The court adopted them and incorporated them into the findings which it made. Upon these findings and the legal conclusions drawn therefrom it gave judgment for plaintiff and the defendants have appealed from that judgment and from the order denying their motion for a new trial.

This statement, incomplete in itself, is designed only as an aid to an understanding of the single question necessary to be considered on this appeal. That question may be thus stated:

What effect upon the original appropriators' rights was worked by the executive orders of withdrawal and the act of congress operating with the laws of this state?

As its answer necessitates the construction of federal laws, the interpretation which the United States has put upon those laws is of all controlling force. The federal law under which the original locators were admittedly acting is that found in section 2339 of the Revised Statutes of the United States, approved July 26, 1866. Notwithstanding its familiarity, it may be well to quote it in part:

"Whenever, by priority of possession, rights to the use of water for mining, agricultural, manufacturing or other purposes have vested and accrued and the same are recog-

nized and acknowledged by the local customs, laws and the decisions of courts, the possessors and owners of such vested rights shall be maintained and protected in the same; and the right of way for the construction of ditches and canals for the purposes herein specified is acknowledged and confirmed."

It is to be noted that the "rights" which are dealt with are, first, rights which have "vested and accrued," and, second, rights which are recognized as such "by the local customs, laws and the decisions of courts." Conceding that the work done up to the time of the suspension of it under the withdrawal orders was sufficient to fulfill the requirements of our state law (Civ. Code, secs. 1415, 1416) it is undisputed that this work was not completed. The first legal question, then, is what is the nature of the rights which the original locators had acquired up to and at the time of the enforced suspension of work under the withdrawal orders? Our cases fully answer this question. As against all the world but the United States there was acquired a possessory right to continue with diligence the prosecution of the work until completion. "Such visible act (of possession accompanied by work) and avowed intent (to prosecute the work adequately and diligently) gave him a conditional right to the future use of the water prior to its actual use, the condition being that he should thereafter diligently continue the work to completion and then divert the water and apply it to a useful purpose, failing which his right would cease. Upon the performance of this condition the title to such use would become complete and perfect. In the meantime, however, he had an existing conditional right, manifested by actual visible possession of the works. It would be clearly a property right, and it being incidental and appurtenant to land, it was real property. (Civ. Code, sec. 658.)" (*Inyo Cons. Water Co. v. Jess*, 161 Cal. 516.) To precisely the same import is the later case of *Merritt v. City of Los Angeles*, 162 Cal. 47. In both of these cases this court was discussing the attempted interference with one who was or claimed to be in possession of the public domain under notices of appropriation, and who was or claimed to be in diligent prosecution of the work as against the hostile claim and interference of a **private third person**. That the law was thus declared by these decisions is unimpeachable in point of soundness may not, we think, be successfully questioned. The property right is not dissimilar to that which this court declares belongs to the locator of oil lands, in peaceable and in diligent prosecution of work seeking a discovery of oil, before the discovery is actually made. Such a locator, we have held, has a possessory right which is property, and which he can maintain in the courts against trespass or hostile private claimants. (*Miller v. Chrisman*, 140 Cal. 440; *Weed v. Snook*, 144 Cal. 439.) But none of these cases, considered, for their exigencies did not call upon them to consider, the character of the rights thus obtained as against the paramount authority, the government of the United States. But we are not without positive pronouncement from the Supreme Court of the United States upon this precise question. In *Bear Lake Irrigation Company v. Garland*, 164 U. S. 1, the section from which we have quoted came before the court and received careful analysis. From the opinion of that case we quote at length, as follows:

"So far as the public land is concerned, over or through which these ditches for the canal were dug, the statutes above cited create no title, legal or equitable, in the individual or company that simply takes possession of such land. The government enacts that any one may go upon its public lands for the purpose of procuring water, digging ditches for canals, etc., and when rights have become vested and accrued which are recognized and acknowledged by the local customs, laws and decisions of courts, such rights are acknowledged and confirmed. Under this statute no right or title to the land, or to a right of way over or through it, or to the use of water from a well thereafter to be dug, vests, as against the government, in the party entering upon possession from the mere fact of such possession, unaccompanied by the performance of any labor thereon.

"Undoubtedly rights as against third persons are acquired by priority of possession, and the government will and does recognize such rights as between those parties. This is the principle running through the cases cited by the counsel for appellants. In *Sullivan v. Northern Spy Mining Company*, 11 Utah, 438, which is one of those cases, the priority of possession of the person who entered upon the public land and dug the well was recognized as thereby making a superior title to the use of the water from the well over that acquired by a person who was the subsequent purchaser of the land from the government. In that case the well had been dug and the condition fulfilled. If no well had ever been dug, and a reasonable time for digging it had passed, the mere priority of possession would have given no superior title to the land over that acquired by the grantee from the government. It is the doing of the work, the completion of the well, or the digging of the ditch, within a reasonable time from the taking possession, that gives the right to use the water in the well or the right of way for the ditches of the canal upon or through the public land. Until the completion of this work, or, in other words, until the performance of the condition upon which the right to forever maintain possession is based, the person taking possession has no title, legal or equitable, as against the government. What, if any, equitable claims a party might have upon the government who did a large amount of work, but finally failed to complete the necessary amount to secure the water or right of way, it is not necessary to determine or discuss. Those equities would not, in any event, amount to an equitable title to the right of way or to the use of the water, and so need not be here considered."

In *United States v. Rickey Land & Cattle Company*, 164 Fed. Rep. 496, Rickey had taken appropriate steps to secure a reservoir site on the public domain, had purchased works of considerable value for the purpose of diverting waters into the reservoir site and was actually engaged in the construction of a tunnel to lead the waters from the reservoir for useful distribution, when the lands affected by his work were temporarily withdrawn, as here by the Secretary of the Interior for reservoir purposes. Rickey proceeded with the work under the contention that against the United States government he had acquired the vested right so to do. The government sought injunction under its bill, setting forth the facts, and the defendant, successor in interest to Rickey, demurred. The demurrer was overruled, the circuit court in so doing and in discussing the question saying: "It is very clear that no one can under these sections acquire as against the government a vested easement in and to public lands for a reservoir site until the actual completion of the reservoir, so that the waters to be impounded therein could be applied to the beneficial uses contemplated by the irrigation system of which it

forms a part. This was the construction placed upon these sections by the Supreme Court in *Bear Lake Irrigation Co. v. Garland*, 164 U. S. 1, 18, 19, 17 Sup. Ct. 7, 12, 41 L. ed. 327."

There can be no argument so sharp as to whittle down the obvious and controlling meaning of the language of these decisions which we have quoted. That language imports this, and nothing but this, that until the completion of the work, no title, legal or equitable, vests in the appropriator, no right vests which the government of the United States is compelled to recognize. The property rights which do accrue are such as to protect the appropriator from the acts of all persons saving the paramount authority. So far as the United States itself is concerned, it is under no justiciable duty in law or equity to such an appropriator until his work shall have been completed.

Before completion what may the United States do? It may do as in the case of oil lands it has done, by withdrawals arrest all work before discovery, without compensation to the locator for his expenditures. (*U. S. v. Mid West Oil Co.*, 236 U. S. 459.) Congress, it is to be remembered, under the constitution of the United States, has the sole power of disposition and control of the public lands. (Const. U. S., art. IV, sec. 3, subd. 2.) In contemplation of this power, the respondent's argument that the orders of withdrawal in this case were temporary orders, that they operated only to suspend and not to destroy the rights of the original locators, and that those rights were revived in all their fullness upon the formal vacation of the orders of withdrawal loses all force in view of the congressional exercise of the power to which we have adverted. Congress, had it chosen to do so, without any order of withdrawal having been made by the executive department, could have granted the lands and rights to the city of Los Angeles, as in fact it did, during the existence of the orders of withdrawal. It may be conceded that to have done so would have been a harsh exercise of the power, but this concession can have no effect upon the legality of the exercise. So here the legal situation presented is, and this statement of it is made in the light most favorable to respondent, that before respondent's predecessors in interest had acquired any vested right in the matter against the United States, Congress, in the exercise of its supreme authority, made conveyance to the city of Los Angeles of the lands and of the waters in connection therewith for all the purposes for which they were designed to be used by the original appropriators. It must be held that these appropriators and all others upon the public domain act with the knowledge and under the peril to their ventures that this may be done. The property rights which they acquire while working and before those rights have become vested as against the government of the United States, are held, as it were, upon condition subsequent, in that they are liable to be extinguished at any time by an act of congress directed to that end.

The conclusion, without regard to any other questions presented, is determinative of this case, and the judgment and order appealed from are therefore reversed.

SUGGESTIONS FOR CONTRACTOR AND DEALER

DEPARTMENT CONDUCTED BY GEORGE A. SCHNEIDER

(One well lighted show window serves as an advertisement to bring in business for more. How to interest the local merchant in adequate lighting is here taken up from the standpoint of the dealer. A discussion of the types of motors for use with centrifugal pumps, a suggestion as to how to eliminate troubles due to abnormal voltage conditions and a note on the rating of fuses follow.—The Editor.)

FALL BUSINESS FOR THE CONTRACTOR

Paragraph "e" of section 35, applying to the installation of gas filled incandescent lamps, in the City of Chicago electrical code reads as follows:

"Where the lamp comes within the usual range of vision, it must be provided with a suitable shade which will so reduce the intensity of the light that it will not be injurious to the eyes."

While this is a sane and sensible requirement, it is only a local ruling and when considered in this light will probably be only of passing interest to many of our readers. It is repeated here not for the purpose of bringing out any particular requirement covering the installation of gas filled lamps, but rather to point out a field that is still latent with possibilities for the electrical dealer and contractor. We have reference to show window lighting. There is need for better and more efficient window lighting and it will pay any contractor or dealer to give this question careful thought during the coming months. A little study will show wonderful possibilities for business along these lines, and a well planned campaign will usually land a reasonable number of the prospects.

There are a number of reasons for poor show window lighting. The principal one is probably that many merchants do not fully realize the advertising value of a well lighted window. Others may think the expense too high whereas by the introduction of modern lighting units, the cost can usually be kept down to a reasonable and satisfactory figure. Again, many merchants try to improve their lighting simply by adding the new high candle power gas filled lamps to existing fixtures. The results are seldom satisfactory and the windows while being brilliantly lighted do not attract the public. We see many examples of this kind wherein the body of the new lamp placed in an old shade or reflector projects so much that the light rays fall within the direct vision of the eye. It is more than likely that the Chicago ruling was drawn up to cover just such cases. Finally, many windows remain poorly lighted because the matter is not called to the attention of the proprietor. All of these points should be remembered in planning a campaign to get business of this kind.

When the dealer has not a solicitor who can spend considerable time on this work alone, enabling him to personally call upon all of the merchants in the vicinity who need better lighting, it is well for the dealer himself to make a study at night. One store in each block should be selected as a prospect, if possible. The windows should be carefully studied. Notes on the size of the window and area of the window floor space should be taken. After this has been done, the dealer should get in touch with his jobber and secure the latest bulletins covering such lighting installations. He should then determine the most

satisfactory type of shade, the number of units and their size required, the approximate first cost of the installation and the probable operating cost, at the prevailing rate of energy for this purpose. With this information compiled he is then in a position to approach his prospective customer and present his proposition most effectively. Sometimes it is best to do the preliminary work by a letter with which is enclosed a bulletin on window lighting. Again a personal call may be best. It will depend entirely on the customer. In any event, once the first prospect is landed, the others become easier, because good window lighting makes an attractive store and other merchants in the vicinity will soon take note of the new installation.

TYPE OF DIRECT CURRENT MOTOR FOR CENTRIFUGAL PUMPS

One of the large electrical manufacturers now recommends motors of the compound-wound type where direct current motors are required for direct connection to centrifugal pumps and further refuses to accept any responsibility for motor operation when customers insist on shunt-wound machines for this purpose. This is an important point. It should be noted carefully by those who may have occasion to handle motor driven centrifugal pumps because in the past it has been common practice to use shunt-wound motors almost exclusively. The later editions of several engineers' handbooks still recommend motors of this class.

Shunt-motors were selected and considered satisfactory because of the low starting torque required by centrifugal pumps. In fact, the torque required by pumps of this class during starting is so low that the characteristics of the motor in this respect become of relatively slight importance. It has been found, however, that the speed regulation and other operating characteristics of the compound-wound motor more nearly counterbalance certain characteristics of centrifugal pumps and in general motors of this type are better suited for this class of service.

In the ordinary stock compound-wound motor with 20 per cent series winding, the drop in speed from no load to full load ranges from 15 to 25 per cent. For centrifugal pump service a closer regulation is better. Motors with a 10 per cent series winding are recommended by this same manufacturer when for use with these pumps.

VALUE OF A VOLTMETER TO THE CONTRACTOR

A large proportion of the troubles with electrical apparatus and appliances is due to abnormal voltage conditions, especially in connection with utilization devices. In most cases the voltage will be found below normal but occasionally trouble due to abnor-

mally high voltage is experienced. Trouble due to low voltage is usually more easily detected than for the reverse condition because the manifestations due to high voltage more nearly resemble other common causes of trouble. Let us illustrate this point more in detail. When operated at lower than normal voltage, lamps will not burn up to full brilliancy, heating devices will not attain their full heat and motors will tend to overheat. The cause of the unsatisfactory results from the lamps and heating devices will at once be apparent. With motors, however, it is necessary to determine whether the overheating is due to overload or low voltage.

Now consider the reverse conditions. With high voltage the life of lamps and heating units is considerably decreased; in fact, if the voltage is abnormally high these may burn out almost immediately. Motors operating above normal voltage tend to overheat when running idle. It is therefore necessary to determine whether the trouble is due to overload or high voltage. On the contrary, when lamps or heating units fail on account of being operated on high voltage the trouble is often charged to defective lamps or units. Very little thought is given to the question of voltage.

Two instances which will serve well to illustrate these points came to the writer's attention some time ago. A 2 h.p. 220-volt induction motor which was direct connected to a certain machine burned out after having been in use for a very short time. Immediately the machinery house who had purchased the motor claimed it to be defective. This was perfectly logical, however, because they had been selling machines of the exact kind equipped with the same type and size of motor and had not previously had trouble so they were reasonably sure the motor could not be overloaded. The machine was urgently needed and so to avoid delay a new motor was sent to replace the burned out one. At the same time instructions were given to the operator to inspect the motor frequently to observe if it was overheating. After having been in use but a short time the motor became very hot and was shut down. Then it was suggested that the voltage be tested. This was done and the motor was found to be operating at 240 volts instead of 220 for which it was wound.

The other case involved burned-out units in a large range. The dealer who sold the ranges and also made the installations claimed the units were defective and in accordance with the terms of the guarantee covering the range, the manufacturer replaced the units promptly. But again they burned out in a very short time. Then the voltage was tested. It was found to average 124 volts while the units were designed for 110 volts. Units for 120 volts were substituted and the units are still giving good service, although it is several months since they were put in to replace the burned-out ones.

It is just such instances that bring home the thought that every electrical contractor should have a reliable portable voltmeter. Such instruments can now be obtained at a very reasonable price and will often save their first cost in a few months. There are a number on the market that are quite satisfactory. One type which seems especially suited to the needs of the contractor is the Weston Model 155. It is reasonably light, has a good scale and will stand considerable rough handling. It can also be supplied

with one, two or three scales covering a wide range. For general work an instrument with 300 and 150-volt scales is probably most convenient, but if 440-volt motor circuits are extensively used in the vicinity, a 600-150-volt or a 600-300-150-volt scale would be more useful. For any of the combinations no external resistors or multipliers are necessary.

VOLTAGE RATING OF FUSES FOR 500-VOLT A. C. SWITCHES

There seems to be some misunderstanding regarding the voltage rating of enclosed fuses for 500-volt A. C. fusible knife switches. The writer has noted several instances of late wherein 250-volt fuses instead of 600-volt fuses have been specified for this service.

In connection with this question, it is well to note the specifications of the National Electrical Code covering such apparatus. Paragraph 65, in the 1915 issue of the Code, covering switches reads in part as follows:

"Switches designed for 250-volt d.c. or 500-volt a.c. circuits, without fuses on the switch base, must be marked 250v., d.c., 500v., a.c. When 250-volt fuse terminals are mounted on the switch base, the marking of the switch must be 250v., d.c. and a.c. When 600-volt fuse terminals are mounted on the switch base the terminals must be spaced for 600-volt fuses and the switches marked 500 volts a.c."

From these requirements, it is, of course, perfectly clear that cut-out terminals on switches for over 250 volts, must be designed and spaced for 600-volt fuses. Therefore, only 600-volt fuses can be used with 500-volt A. C. switches. The 500-volt A. C. switch is nothing more than a 250-volt D. C. switch with suitable terminals for 500-volt fuses.

On account of the larger spacing required in 600-volt switches they are considerably higher in cost than the corresponding 500-volt A. C. switches. This is especially noticeable in the switches of the enclosed type.

SELECTING TIME SWITCHES FOR APARTMENT HOUSE LIGHTING

There are usually two groups of lamps in apartment house lighting, one for the halls and the other for the exits. Sometimes it is necessary to light both groups early in the evening, then later on one group is extinguished, the other burning until morning when it is also extinguished. Again the groups may be arranged so that the hall lights only are lighted in the evening. Later these are extinguished but at the same instant the exit lamps are lighted and allowed to burn until morning when they are extinguished. When selecting a time switch these points should have attention, otherwise the wrong switch may be chosen.

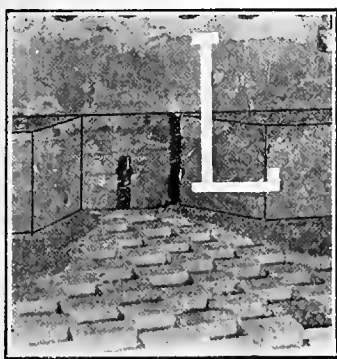
One of the well known time switches is so designed that either of the operating combinations just noted can be selected depending upon the connections between lamps and switch. As received from the factory, the connections are arranged so the groups would be controlled in accordance with the second method. However by changing the external connections the other combination is possible. No doubt several other clocks in the market would also work either way. In any case this could be determined by a few simple tests which the wiremen could easily make.

FUEL OIL AND STEAM ENGINEERING

(Recent evolution in efficient operation of the furnace for fuel oil burning emphasizes even more clearly than in the past that the furnace design itself has more to do with the production of economic results than any other single factor. In this article the authors first describe the operation of the fuel oil furnace and then, step by step, trace the evolution in design from the early days of fuel oil application a score of years ago to the present efficient furnace design in the modern boiler installations both on land and sea.—The Editor.)

FURNACES IN FUEL OIL PRACTICE

BY ROBERT SIBLEY AND CHAS. H. DELANY



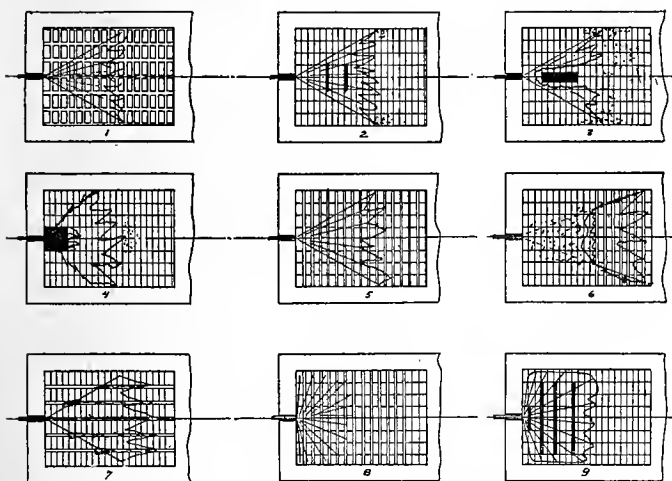
Interior of a Furnace, showing Brickwork and Air Spacing

LET us now set forth the cycle of operations necessary in the utilization of crude petroleum as an economic factor in the production of steam. The oil in a heated state and under pressure must be sprayed into a heated compartment or furnace so that its particles are in fine globules or even in a gaseous state. Such an operation is known as atomization and this

must be accomplished in an efficient and thorough manner. Three methods are utilized in practice to accomplish this. In the first instance steam under pressure is mixed with the oil and the ingredients thus shot into the furnace. In the second instance compressed air is used to accomplish this result, and in the third instance, some mechanical device or physical characteristic of the oil is made use of to whirl or thrust the oil into the furnace in a pulverized or

atomized, it must be brought into contact with the requisite quantity of air for its combustion, and this quantity of air must be at the same time a minimum to avoid undue heat losses that may be carried away in the outgoing flue gases. To accomplish this result the checkerwork under the burners that control the admission of air must be properly designed. The proper quantity of air admission as a whole is controlled by means of draft regulation. An illustration of how this may be sensitively controlled was shown in the chapter on the fundamentals of furnace operation.

To accomplish the even admission of air into the furnace the arrangement of the check-board of brickwork below the flame is of utmost importance, otherwise unequal heating and imperfect combustion is sure to follow. Let us then examine a chart formulated by E. N. Percy of the Standard Oil Company's technical staff. In Fig. 1 we have a fan-shaped flame with openings between all the bricks. The flame does not cover all of the bricks, hence, no matter what the conditions are there will be an excess of air and the boiler cannot work economically since it costs as much to heat air as it does to heat water. Fig. 2 shows two large openings under the middle of the flame; such a flame will burn hot in the center and deposit carbon in the corners as shown. In Fig. 3 we have a large opening under the flame flow; this arrangement will cause the flame to tear and burn intensely at the center while depositing carbon around the corners, as well as allowing cold air to rise and strike the boiler directly. The large opening in Fig. 4 allows quantities of oil to escape over the flame; intense combustion will take place close to the burner, thereby over-heating it, and at the same time the flame will be irregular and ragged. It will smoke and deposit carbon at the tips. The transverse openings between all the bricks as shown in Fig. 5 allows at all times a great excess of air and hence are not economic. Fig. 6 shows draft orifices in the neighborhood of the burner; such a flame will burn clear at the tips, but it will smoke and deposit carbon near the burner. The longitudinal slots in Fig. 7 tend to tear the flame. In Fig. 8, the arrangement gives a broader and more correctly shaped flame, still an excess of air is admitted and cold air allowed to pass up against the boiler because the draft slots extend beyond the end of the flame. Fig. 9 approaches more nearly to the correct arrangement of bricks and the correct shape of flame for a flat flame furnace.



THEORETICAL DISPLAY FOR BRICKWORK AND AIR-SPACINGS

In the nine illustrations shown above are graphically displayed the behavior of the furnace flame and the formation of carbon for various arrangements of air spacings below the flame. In the ninth instance a theoretically perfect flame is obtained.

atomized state. Literally hundreds of inventions have been made to effect the atomization of oil. It is to be remembered, however, that in the consideration of fuel oil economy, the furnace and its efficient construction are after all the real factors that go toward economic fuel consumption.

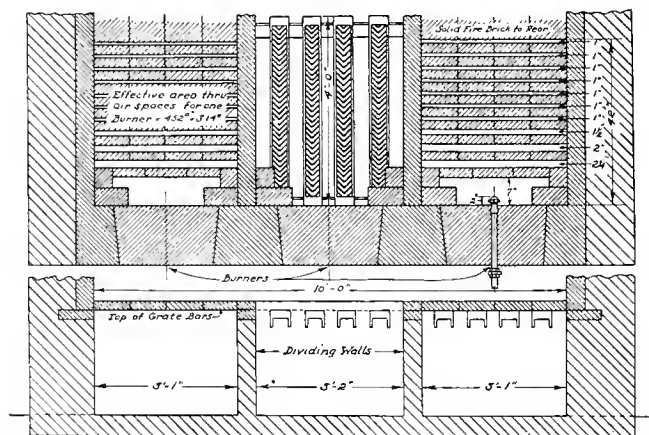
Fuel Oil Furnace Operation.—When the oil is

An excellent furnace is shown in the illustration which shows the floor plan of a back shot furnace arrangement, the burner being set in a recess in the bridge wall. The recess is made large enough for the removal of the burner and piers of fire brick are built

on the furnace floor in front of the recess so that there is an opening about 12 in. by 9 in. through which the mixture of oil and steam enters the furnace from the burner. A certain quantity of air enters through the same opening, being drawn in by the force of the oil and steam. A bracket is provided to hold the burner at the center of the opening.

Air openings through the checker work on the grates commence some 8 or 10 in. from the burner, the number of openings and the width increasing gradually until about two feet from the burner the openings extend across the full width of the furnace. There are no openings between the burners near the bridge wall so that no air can enter except where it comes in contact with the atomized oil. The fire brick piers between the burners become hot and assist in the ignition of the oil.

The distance the air openings are extended from the burners and the total area of air openings depends on the draft available and the capacity required from the boiler. With a draft of .1 of an inch in the furnace a free area of $2\frac{1}{2}$ sq. inches per rated boiler horsepower through the checker work and $\frac{1}{2}$ sq. in. per horsepower around the burner, making a total of 3 sq. ins. per horsepower, is sufficient to operate the boiler from its rated capacity up to 50% overload. If more capacity than this is required either a greater furnace draft must be provided or more openings through the checker work must be installed so as to increase the area. The amount of stack draft necessary to maintain .1 of an inch furnace draft depends upon the type of boiler and the capacity at which it is operated as this will determine the draft loss through the boiler. The loss of draft between the

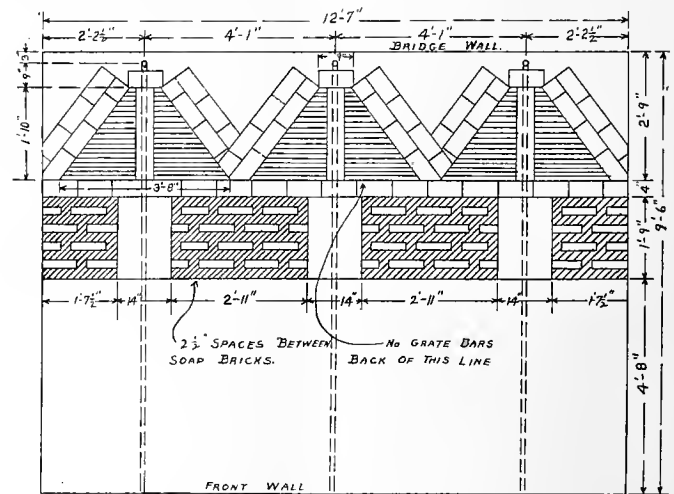


ARRANGEMENT OF AIR SPACES AND GRATE BARS FOR FUEL OIL PRACTICE

The details of furnace construction have more to do with efficient operation in the burning of fuel oil than anything else. In each particular installation this matter should receive careful attention. In the illustrations are shown the plan and elevation of the air spaces and grate bars for the Parker boiler installation for the Fruitvale Station of the Southern Pacific Co. This boiler developed an evaporative efficiency of 83.69 per cent under trial test.

breeching and the furnace usually runs from about .15 of an inch at the boilers' rating up to .8 or one inch at double rating.

The location of the flame can be varied by changing the height of the burner above the checker work, this height usually varying from 4 in. to 8 in. or 9 in. The character of the flame can also be varied by changing the distance the air openings extend from the burners. It is customary to have the furthestmost air openings about four or five feet distant from the



AN EXCELLENT FURNACE DESIGN FOR FUEL OIL BURNING

In this view the floor plan of a back shot furnace arrangement is shown. The burner is set in a recess in the bridge wall. This design has proven of high order in central station installations of the West.

burner, the furnace floor beyond this point being covered with solid brick. By bringing the air openings somewhat farther out than this the flame can be made to turn up or by having the air openings extended out a shorter distance the flame can be made to hug closely to the floor of the furnace.

The Commercial Furnace.—Illustrations are shown in this article that set forth the check-board of brick work for air admission in the commercial practice of boiler economy. Let us now consider all the principal factors that must be considered in picking an efficient type of commercial furnace.

The furnace must be constructed of such heat tested brick-work that it will stand up under the high temperatures developed and the refractory material of which it is composed must be so installed as to radiate heat to assist the combustion of the heated ingredients of the fuel.

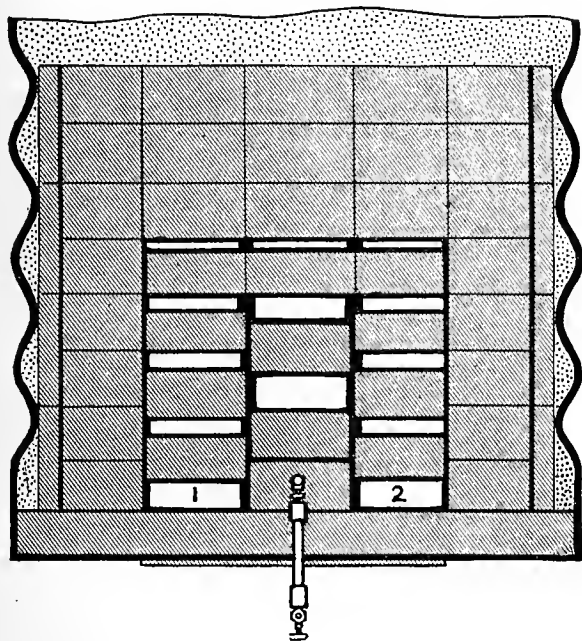
This combustion must be entirely completed before the gases come in contact with the heating surfaces of the boiler. Otherwise, the flame will be extinguished, possibly to unite later in the flue connection or in the stack. This means that ample space must be provided in the volumetric proportions of the furnace to insure this combustion before the gases begin to travel upward against the boiler surfaces.

Finally, there must be no localization of the heat on certain portions of the heating surfaces or trouble will result from overheating and blistering. This is one of the more serious defects that had to be overcome in the earlier days of fuel oil practice. The burner has much to do with the avoidance of this localization activity.

Regulation of Air.—The area of air openings through the checker-work should be made of sufficient size to operate the boiler at the maximum capacity required and then when operating at lighter loads the air supply should be very carefully regulated. There are two ways by which the air can be regulated, namely, by the damper at the outlet of the boiler or by the ash pit doors. If the air is regulated by the ash pit doors, the damper being left wide open, there will be a strong draft within the setting tending to cause air to leak in through all the cracks in the brick

work. The strong draft also tends to pull the gases through the setting by the shortest cuts so that a thin stream of gases flows through and the setting is not properly filled out so that some of the heating surface is not swept by the gases.

If on the other hand the ash pit doors are left wide open and the air is regulated by partly closing the damper, the draft inside the boiler setting is very



PLAN OF BRICKWORK AND AIR SPACINGS IN MARINE PRACTICE

In the practical application of the theoretical deductions for proper air spacings commercial designers differ somewhat from the theoretical reasoning involved. In this illustration is shown the brickwork and air-spacings for Scotch marine boilers recommended by a prominent company.

slight so that the air leakage is reduced to a minimum. There is little force tending to change the direction of the flow of the gases so that they travel of their own momentum to the furthestmost corners and fill out the setting completely, thus coming in contact with all the heating surface of the boiler. It is, therefore, much better to regulate the air by means of the damper than by means of the ash pit doors. In the case of very light loads, however, it is best to use both the damper and the ash pit doors because if the damper alone is used there may be a positive pressure produced in the upper part of the setting causing gas and smoke to leak out into the fire room.

Importance of Air Regulation.—The regulation of the air supply is one of the most important things in the operation of oil fired boilers. If there is not enough air a great waste of fuel may occur as it is possible to feed the oil into the furnace in large quantities and if there is not enough air to burn it the oil and gas will simply pass up to the chimney unburned. On the other hand, it is possible to waste just as much fuel by allowing too much air to enter the furnace as all of the extra air is heated up and passes out at the temperature of the chimney gases, carrying away with it an enormous amount of heat. To determine accurately the amount of air required for the best conditions it is necessary to analyze the flue gases. Many plants, however, are not provided with the apparatus necessary for this and in such cases the air may be regulated with a fair degree of accuracy by an obser-

vation of the smoke discharged from the stack. For perfect combustion there should be no smoke and if any smoke appears it means incomplete combustion and not enough air. If there is no smoke, however, it does not follow that the conditions are right, as no smoke may mean either just the right amount of air or a large excess of air. To properly regulate the air, therefore, if the boiler is operating with no smoke the damper should be gradually closed until a light gray smoke just begins to appear; if then the damper is opened very slightly this smoke will be barely perceptible and the conditions for the most economical operation will be obtained.

Service For One Burner Only.—Where boilers having more than one burner are operated at very light loads it is necessary at times to have only one burner in operation, the other burners being shut off. For such service as this it is very desirable to have the ash pit divided into as many sections as there are burners so that when one burner is shut off the ash pit door opposite that door can be closed tight and no air from the other ash pit doors will enter the furnace opposite that particular burner. With this arrangement it is possible to operate a large boiler at fractional loads and still maintain fairly good economy.

NEW NORWEGIAN ELECTRODE FACTORY

Previous to the war most of the electrodes imported into Norway came from Italy, Sweden and the United States, but for some time now the imports have come almost solely from the United States.

In anticipation of its plant becoming inadequate and the necessity of erecting a branch factory, the Norske Elektrodeverker has purchased the rights to the entire power to be derived from a waterfall on the west coast of Norway near Kristiansund.

TELEPHONE COMPANY'S PROTEST AGAINST BRAZIL'S INCOME TAX

As a protest against the collection of a new 5 per cent tax on incomes, the Port of Para Corporation, the Société des Chemins de Fer du Bresil, the Interurban Telephone Company, and many other foreign corporations have applied to the Federal Court and obtained an injunction to restrain the government from collecting this 5 per cent upon dividends and interest coupons of their shares, on sums paid here or abroad. The Federal collectors have likewise been provisionally advised that the collection of these amounts is considered to be illegal.

ELECTRICAL ARTICLES REQUIRING EXPORT LICENCE.

Electric light carbons, electrical equipment and instruments, generators and motors, aeronautical and wireless apparatus, electrically driven pumps, searchlights, tungsten, telephone and x-ray apparatus—and electrical equipment generally are among the articles included under the second division of the President's proclamation, requiring license for export to any foreign country. Application Form A-2 is the license form to be executed by shippers and may be obtained from the Bureau of Export Licences, 2435 K street N. W., Washington, D. C., or from any branch of that bureau.

CONVENTION OF UTAH SOCIETY OF

At a meeting held in Salt Lake October 5th and 6th, and attended by representative contractors and dealers from all sections of Utah and Idaho, the Utah Society of Electrical Contractors and Dealers was organized and launched under exceptionally favorable conditions, and with great enthusiasm on the part of those present.

Following a noonday luncheon at the Commercial Club, on Friday, John V. Buckle of Salt Lake in an address of welcome pointed out the value and need of an association embracing not only the State of Utah but also such parts of Idaho, Montana and Wyoming as might have interests in common.

Among the subjects he suggested for consideration by the new association were the creation of a State Inspection bureau, organization of a credit bureau, and frequent meetings to discuss subjects of vital interest such as improved methods of accounting; figuring of costs and ways and means of increasing the scope and volume of their business.

La Fayette Hanchett, Commissioner of Salt Lake county, taking as his theme the text "Out of the dreams of men," reviewed the development of the electrical industry in a very interesting manner, quoting numerous personal experiences with the earlier types of present day appliances.

Starting with Franklin, who drew an electric current from the sky with his kite and key, he touched in turn on the important successive steps forward, pointing out how seemingly idle dreams have, through persistent and combined effort, become realities. The possibilities of the future are in his opinion equally great and the contractor-dealer should prepare himself to meet such advances.

W. R. Putnam, Division and Sales Manager of the Utah Power and Light Company, discussed the subject "Relationship of the Contractor to the Central Station" in his characteristic frank and outspoken manner. He pointed out the necessity of educating the public to the use of electrical appliances and showed how impossible it would have been for the contractor dealers alone to have developed the business in Utah to its present position except at a prohibitive cost to themselves, whereas the lighting company was in position to do so economically. He also pointed out the responsibility and obligation resting upon the management of the lighting company in relation to its stockholders, which must necessarily receive full consideration.

In closing he expressed his desire to assist in every way that he could, consistent with his company's interests, in improving the situation from the contractor dealer's standpoint.

W. M. Deming, of the Journal of Electricity, spoke on the value of organization in dealing with problems of mutual interest, pointing out the benefits derived from similar associations in other sections of the country and the necessity of keeping abreast of the times, especially during the present period of abnormal and rapidly changing conditions.

"The Relation of the Contractor to the Jobber" was covered in a most excellent manner by C. B. Hawley of the Inter-Mountain Electric Company.

THE OCCASION

An enthusiastic and striking group of men of the industry—the first banquet of the Utah Society of Electrical Contractors and dealers, Salt Lake City.



That there is a community of interest which can best be served by full co-operation was well brought out in his talk.

Edw. H. Eardley, of Eardley Bros. Co., taking as his subject "Why a State Electrical Organization," set forth in a concise and convincing manner the many arguments in favor of such an organization, quoting in support of his views statements of E. N. Hurley, now head of the U. S. shipping board, but who while serving on the Federal Trade Commission made an exhaustive study of trade conditions and the effect of trade associations in connection therewith.

The meeting on Saturday opened with an address by the Hon. Simon Bamberger, Governor of Utah, in which he outlined general conditions throughout the State, referring to the serious situation brought about by the shortage of labor which might result in more or less serious loss of foodstuffs unless the canneries receive prompt assistance.

He heartily endorsed the motives in forming the association and expressed the opinion that it would prove of great value in developing the national resources of the State, as well as the individual interests of the members.

The Rev. P. A. Simpkins, in an address interspersed with his characteristic wit and humor, stated that while we might expect continued prosperity at the close of the war, it would undoubtedly be on a basis of keener competition and closer margins of profits. The members of the association have a duty to perform in that they must educate themselves so as to deal intelligently with the new problems so soon to confront them and also become better servants to the public, whose education should be conducted along broad lines.

"The Need of a State Inspection and the Organization of a State Inspection Bureau" was discussed

ELECTRICAL CONTRACTORS AND DEALERS

**THE
DEMONSTRATION**

True to ideals of the industry, the banquetters partook of hot viands prepared by the electrically operated oven observable in the foreground.

by Fred C. Winegar, City Electrical Inspector, who outlined the advantages and needs of same.

"The Electrical Contractor" was the subject of an interesting paper by Golden J. Guiver, Business Agent of the Utah Society of Electrical Contractors, in which he outlined present conditions and the advantages to be obtained from closer co-operation.

The constitution of the society submitted by the committee was after slight changes adopted unanimously and the following officers elected for the ensuing year:

President—John V. Buckle, Buckle Electric Company, Salt Lake.

Vice-President—L. G. Robbins, Robbins Electric Company, Salt Lake.

Executive Committee—E. H. Eardley, Eardley Bros. Company, Salt Lake; Leroy Bourne, Provo; B. D. Phillips, Phillips Electric Company, Brigham; N. L. Taylor, Cache Valley Electric Company, Logan, Utah; E. A. Brough, Montpelier Electric Company, Montpelier, Idaho.

At the close of the Saturday afternoon session the members and guests were taken for a sight-seeing trip about the city and Fort Douglas, concluding with an official photograph of the party taken on the steps of the State capitol.

Saturday evening the Utah Power and Light Company gave a banquet at the Commercial Club to the members of the association and its guests.

Mr. S. R. Inch, General Manager of the Utah Power and Light Company, congratulated the association on its progressive action, expressed his appreciation of the value of the contractor and dealer to the Central Station and also pointed out the advantages to the contractor dealer of the Central Station's activities in widening the field for electrical devices.

Mr. Putnam then introduced—

Markham Cheever, Manager of the Phoenix Construction Company and Chief Engineer of the Utah Power and Light Company;

Bismark Snyder, Attorney for the Utah Power and Light Company;

P. N. Parry, Division Manager of the Ogden District;

E. R. Owen, Division Manager at Logan;

R. Timmerman, Division Manager at Bingham;

D. E. King, Division Manager at Park City;

J. F. Derge, Supt. of Lighting Appliance Sales;

R. E. Bailey, Supt. of Power Sales;

Glenn Walker, Supt. of Commercial Sales;

C. W. Kendall, Supt. of Residence Sales;

E. J. Falloon, Supt. of Irrigation Sales; and

R. H. Jones, Cashier,

all of whom expressed their pleasure over the step taken and promised their support.

A novel feature of the banquet was the installation of a large Hughes electric oven in the dining room, with a chef in cap and apron in charge, who prepared and baked the rolls and pastry served at the banquet, in full view of the diners.

The convention closed with a dance and reception at the Newhouse Hotel.

Surprising Results at the Utah State Fair

The Utah Power and Light Co. at Salt Lake City advises that results obtained from its exhibits at the State Fair held in Salt Lake during the week ending Oct. 6th were most gratifying.

Over \$1000 was expended in equipping a number of separate booths, located at suitable points about the grounds, and so great was the interest in them that the services of from 8 to 12 experienced men were required to answer inquiries.

In one booth a large Hughes electric oven was in continuous operation baking biscuits, cookies, etc., which found a ready sale among the visitors. In fact, the demand far exceeded the supply.

In another booth equipped with electric ranges, demonstrations of cooking, roasting, etc., drew large crowds, while other booths equipped to demonstrate washing machines and electric irons; vacuum cleaners; percolators, toasters, grills and heaters; and other current consuming devices, were equally popular.

A large tent containing working exhibits of various power applications, such as electrically driven irrigation pumps, etc., was also a center of interest.

As the attendance at the Fair exceeded 60,000 and represented all sections of the State, the great value of this exhibit is apparent, and the lighting company is subject to congratulation.

Activities of Leaders of the Convention

W. R. Putnam, Division and Sales Manager of Utah Power & Light Co., Salt Lake, has put so many fine things across that it is no wonder his friends, of whom there seem to be a host, have nicknamed him "Put." He has made an enviable record for himself and his company by the manner in which he has en-

couraged and extended the use of electrical appliances throughout the territory he serves, yet, notwithstanding his aggressive policy in this respect he has retained the good-will and confidence of the contractors and dealers with whom he comes in contact. This is shown by the active part he was called upon to take in the organization of the Utah Contractors and Dealers' Association. His excellent work in this connection and his assurances of hearty and material co-operation have still further strengthened the cordial relations which previously existed.

"Put" has also been put in charge of the Publicity campaign in the State of Utah for the second Liberty Bond loan. That he is again putting it across is indicated by the fact that up to last Saturday over \$2,000,000, or 20% of the State's quota of \$10,000,000, had been subscribed, although the real drive had not yet begun. Our hats are off to "Put."

* * *

C. B. Hawley, of the Inter-Mountain Electric Co., is chairman of the committee which will solicit the electrical trade for the Liberty Loan. The interest shown at the recent association of the Utah Electrical contractors and dealers' meetings indicates liberal response.

* * *

Speaking of the Liberty Loan, the Utah regiment of field artillery, 1400 men, now stationed at Fort Douglas, celebrated pay-day by subscribing \$100,000 for Liberty bonds, payments to be deducted from their pay. Utah may well be proud of her boys who not only volunteered their services but contributed so liberally of their money.

* * *

The various committees having in charge the detail arrangements for the meeting of the Utah Society of Electrical Contractors and Dealers are to be congratulated on the excellent manner in which they handled matters.

* * *

Z. S. Gwaltney, president and manager of the Idaho Electric Supply Co., Boise, Idaho, was a recent visitor in Salt Lake. He states that business in his section is most satisfactory.

The Electrical Contractors and Dealers at Play

The bowling contest Friday evening resulted in an overwhelming victory for the contractors, the score being 1356 to 1236 in their favor. If the team work displayed by the contractors, both players and spectators, in this contest is a fair index of what may be expected from them in future, the success of the Utah Association is assured.

The line-up was as follows:

Contractors	Jobbers
Buckle	Rinehart
Guiver	Ackerman
Boyd	Folland
Wolters	Hawley
Forsberg	Moser
Hild	Carter
	Evans

Ackerman carried off the individual honors with a score of 111 for one game, but Guiver, Buckle and Boyd also passed the century mark.

Wolters must be a baseball fan also, for at a critical point of the game he gave an excellent demonstration of a slide for the home plate.

The jobbers gave various excuses for their defeat. Hawley claimed that he had become so used to shoot-

ing for the hole in golf that he couldn't miss it now, even in a bowling game. Folland claimed that he must have overtrained. Even Rinehart seemed unable to get his range-finder working properly.

Registration at the Convention

W. R. Putnam, Div. Mgr. Utah Pr. & Lt. Co., Salt Lake City
 J. V. Buckle, Buckle Electric Co., Salt Lake City
 Edw. H. Eardley, Mgr. Eardley Bros. Co., Salt Lake City
 G. J. Guiver, Bus. Mgr. Utah Soc. of Elec. Contr's., Salt Lake City
 Jas. L. Fugate, Eardley Bros., Salt Lake City
 E. E. Brazier, Sales Mgr. Inter-Mtn. Elec. Co., Salt Lake City
 Jas. Swyers, Jas. Swyers Electric Co., Salt Lake City
 A. H. Nicoll, Western Electric Co., Salt Lake City
 J. P. Anderson, Western Electric Co., Salt Lake City
 Chas. F. Dowden, Inter-Mountain Electric Co., Salt Lake City
 F. G. Allen, 82 E. Street, Salt Lake City
 G. A. Hill, 224 Princeton Ave., Salt Lake City
 Fred C. Wolters, Mgr. Modern Electric Co., Salt Lake City
 Julius F. Derge, Utah Power & Light Co., Salt Lake City
 G. A. Patterson, Inter-Mountain Electric Co., Salt Lake City
 J. P. Sprunt, Jr., Westinghouse Elec. & Mfg. Co., Salt Lake City
 E. E. Powell, Los Angeles, Cal.
 F. W. Wilson, Standard Und. Cable Co., Salt Lake City
 Ernest G. Dee, General Electric Co., Salt Lake City
 Julius Kurtz, Westinghouse Elec. & Mfg. Co., Salt Lake City
 L. E. Brown, Westinghouse Elec. & Mfg. Co., Salt Lake City
 G. W. Perlewitz, Western Electric Co., Salt Lake City
 G. H. Forsberg, Inter-Mountain Electric Co., Salt Lake City
 C. H. Sphar, Western Union Tel. Co., Salt Lake City
 Chas. C. Bush, Inter-Mountain Electric Co., Salt Lake City
 Myron Manwaring, Murray City Corp., Murray City, Utah
 D. A. Sullivan, Utah Pwr. & Lt. Co., Layton, Utah
 C. S. Jones, Jones Electric Co., Salt Lake City
 R. S. Folland, Capital Electric Co., Salt Lake City
 H. E. Webb, Brigham Electric Co., Brigham, Utah
 Samuel F. Grant, Grant Electric Co., American Fork, Utah
 L. G. Robbins, Robbins Electric Co., Salt Lake City
 J. G. Larison, Mgr. Buckle Electric Co., Ogden, Utah
 W. H. Showell, Showell Electric Co., Salt Lake City
 F. D. Winegar, City Electric Inspector, Salt Lake City
 H. J. Snively, Western Electric Co., Salt Lake City
 E. N. Maddox, Inter-Mountain Electric Co., Salt Lake City
 Stanley S. Stevens, Century Electric Co., St. Louis, Mo.
 E. A. Brough, Montpelier Electric Co., Montpelier, Idaho
 F. E. Weidner, Inter-Mountain Electric Co., Salt Lake City
 F. C. Rinehart, General Electric Co., Salt Lake City
 Ray Ackerman, Capital Electric Co., Salt Lake City
 H. D. Randall, General Electric Co., Salt Lake City
 H. B. Lynch, Eardley Bros. Co., Salt Lake City
 C. B. Hawley, Inter-Mountain Electric Co., Salt Lake City
 E. R. Akert, General Electric Co., Salt Lake City
 J. A. Van Dusen, Inter-Mountain Electric Co., Salt Lake City
 H. M. Mayer, Inter-Mountain Electric Co., Salt Lake City
 Wm. G. Bruce, Eardley Bros. Co., Salt Lake City
 Darwin Ulke, Central Electric Co., Salt Lake City
 C. H. Talmage, Western Electric Co., Salt Lake City
 E. E. Reber, Inter-Mountain Electric Co., Salt Lake City
 H. P. Stewart, Western Electric Co., Salt Lake City
 P. B. Garoutte, Am. Steel & Wire Co., Salt Lake City
 J. J. Crowe, Salt Lake Hardware Co., Salt Lake City
 Leon D. Collins, Western Electric Co., Salt Lake City
 S. W. Leaver, Inter-Mountain Electric Co., Salt Lake City
 H. T. Plumb, General Electric Co., Salt Lake City
 Lon. J. Haddock, Salt Lake City
 R. C. Carter, Electric Supply Co., Salt Lake City
 H. W. Read, Inter-mountain Electric Co., Salt Lake City
 R. H. Jones, Utah Pwr. & Lt. Co., Salt Lake City
 Willard Call, Call Electric Automatic Switch, Denver, Colorado
 A. A. Moulton, Capital Electric Co., Salt Lake City
 E. G. Holding, Holding Electric Co., Salt Lake City
 Fern N. Boyd, Buckle Electric Co., Salt Lake City
 N. L. Taylor, Cache Valley Electric Co., Logan, Utah
 L. A. Herdte, Ogden Electric Supply Co., Ogden, Utah
 Rev. P. A. Simpkins, Salt Lake City
 C. L. Archer, Utah Pwr. & Lt. Co., Salt Lake City
 H. C. McGregor, E. E. Board Fire Underwriters, Salt Lake City
 H. L. Laub, Cache Valley Electric Co., Logan, Utah
 Everready Martin, Ever Ready Co., Salt Lake City
 Herman Kratzer, Salt Lake City
 V. O. Phillips, Phillips Electric Co., Brigham, Utah
 L. J. Christensen, Ass't City Electric Inspector, Salt Lake City
 R. E. Bailey, Utah Pwr. & Lt. Co., Salt Lake City
 D. E. King, Utah Pwr. & Lt. Co., Park City, Utah
 Markham Cheever, Utah Pwr. & Lt. Co., Salt Lake City
 S. R. Inch, Utah Pwr. & Lt. Co., Salt Lake City
 Bismarck Snyder, Utah Pwr. & Lt. Co., Salt Lake City
 C. W. Kendall, Utah Pwr. & Lt. Co., Salt Lake City
 R. Timmerman, Utah Pwr. & Lt. Co., Bingham, Utah
 E. J. Falloon, Utah Pwr. & Lt. Co., Salt Lake City
 E. R. Owen, Utah Pwr. & Lt. Co., Logan, Utah
 Glenn B. Walker, Utah Pwr. & Lt. Co., Salt Lake City
 P. N. Parry, Utah Pwr. & Lt. Co., Ogden, Utah
 R. E. Jerauld, General Electric Co., Salt Lake City
 J. L. Schricker, Inter-Mountain Electric Co., Salt Lake City
 Geo. Bennett, Eardley Bros. Co., Salt Lake City
 H. S. Dinkelacker, American Electric Co., Twin Falls, Idaho
 Harold W. Langton, Eardley Bros. Co., Salt Lake City
 Arthur Purdon, General Electric Co., Salt Lake City
 B. C. Rand, General Electric Co., Salt Lake City
 T. A. Purton, General Electric Co., Salt Lake City
 Chester P. Cahoon, Progress Electric Co., Murray, Utah
 W. B. Goddard, Capital Electric Co., Salt Lake City
 H. K. Schiehe, Capital Electric Co., Salt Lake City
 Geo. R. Randall, Salt Lake Electric Supply Co., Salt Lake City
 Ross L. Douglas, Capital Electric Co., Salt Lake City
 Robt. Miller, General Electric Co., Salt Lake City
 E. F. Schettler, Inter-Mountain Electric Co., Salt Lake City
 Jno. J. O'Carroll, Electric Supply Co., Salt Lake City
 Dan'l A. Vierheller, Wilksburg, Pa.
 W. M. Deming, Journal of Electricity, San Francisco, Cal.
 Jno. Jones, Westinghouse Elec. & Mfg. Co., Salt Lake City
 E. A. Evans, Westinghouse Lamp Co., Salt Lake City

SPARKS—Current Facts, Figures and Fancy

(The high prices of fuel and raw materials together with the scarcity in the labor market have brought about a serious condition in industry the world over, but still reports of trade are good and the electrical industry here as well as abroad is finding the time to do research work for the government and the money to subscribe to the Liberty Loan. Inventions and new applications of electricity are always of interest, particularly as it is difficult to say what new wrinkle of efficiency, even in the fields of peace, will be the one to win the war.—The Editor.)

It is interesting to note that Japan as well as the United States is suffering from the high cost of coal. Suggestion has been made there that the best solution of the situation is the placing of the regulation of prices in the hands of the government.

* * *

That we will some day get our fuel supply from weeds and garbage is suggested by Alexander Graham Bell. Alcohol and water power, as he points out, are going to be the two most dependable sources of energy for the future. A great field of usefulness is opening up for the engineer who will modify machinery to enable alcohol to be used as the source of power.

* * *

An interesting cooling plant is being used in Paris. Large pipes are laid down under the streets with small branch pipes leading to the cafés and restaurants. Engines from a central station keep up a continuous pressure, thus supplying air for cooling rooms at a ground temperature. Will some big electrically run refrigerating plant some day supply cool air for summer use, to balance the furnace of the winter?

* * *

The grasshopper is now proving itself dangerous to power plants. A new rival to the use of hydroelectric energy for the manufacture of nitrate products is found in the proposition of the Uruguayan Government to utilize the locust in the manufacture of fertilizer. This insect, it is stated, is rich in nitrogen and phosphoric acid. To fertilize your crop with the insect which was destroying it is to make lemonade of your lemons, indeed.

* * *

The high cost of living is made the basis for a cry for higher wages the nation over. But industry has to eat as well—and here is a hint as to what has happened to the prices of its food: Steel has advanced in price 300 per cent, lumber 125 per cent, rubber 110 to 115 per cent, paint 125 per cent. One mile of trolley wire cost \$721 now, compared with \$327 two years ago. What is eaten must be paid for—and the increase in costs can only fairly be met by an increase in earnings as well.

* * *

The Peoples Gas Light & Coke Company of Chicago is utilizing the "movies" to sell a new gas heated electric washer that has just been put on the market. The machine boils and washes clothes at the same time. In order to demonstrate the appliance before the greatest number of possible buyers in the shortest possible time the company had a one-reel film made

showing the "emancipated housewife" operating the machine. The picture is being shown in three moving picture theatres each week and it will be continued until it has visited every section of the city.

* * *

California is not behind in its war quota. A report from the engineering colleges throughout the country shows that seven out of fifty-one expect a 100 per cent attendance. Three only expect a loss as great as 40 per cent. Of these the University of California must be counted as one, for only 105 of 163 students in Civil Engineering are at hand this fall, and the College of Mechanics has lost fully one-third of its enrollment. Chemistry alone of the colleges shows an increase, its figure for 1917 being higher by 2 than in 1916.

* * *

A new condition confronts business men engaged in the production or distribution of foods, feed, fuel, including fuel oil and natural gas, fertilizer and its ingredients, and tools, utensils, implements, machinery and equipment required for the production of foods, feed and fuel. These lines of business are now by Act of Congress under Government control, and must be conducted in accordance with regulations to be issued from time to time by President Wilson, and by Herbert Hoover, who acts under his authority.

* * *

The branding of oranges and other citrus fruits of California, Texas and Florida with trade names by means of an electrical device promises to become a general practice. An electric iron is used to brand the orange. There is a big wheel filled with spokes. At the end of each spoke is a branding iron, or die, bearing the word to be used. The heat rises until it reaches a certain temperature, and then a thermostat arrangement shuts off the heat and reduces the temperature, so it is impossible to burn the skin of the fruit and at the same time the iron will not become too cool to perform its function.—Hot Point Weekly.

* * *

The Advisory Council has recommended that the money made available from the new five million dollar fund voted by Parliament should be spent in the form of grants in aid of research undertaken by firms in any industry which may combine to conduct it on a co-operative basis. The council advises that the best means to this end is the establishment, under the Companies Acts, of associations for research, limited by guaranty and trading without profit. The electrical engineering firms and the British Society of Aircraft Constructors, in conjunction with the Aeronautical Society, have the matter under consideration.

JOURNAL OF ELECTRICITY

FOUNDED 1887

PUBLISHED SEMI-MONTHLY BY THE

Technical Publishing Company

Crossley Building, San Francisco

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., required by the Act of Congress of August 24, 1912, of "Journal of Electricity," published semi-monthly at San Francisco, California, for October 1, 1917.

State of California,
County of San Francisco—ss.

Before me, a notary in and for the state and county aforesaid, personally appeared Willis M. Deming, who, having been duly sworn according to law, deposes and says that he is the vice-president and business manager of the "Journal of Electricity," and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

Publisher, Technical Publishing Company.....No. 6 Crossley Bldg., San Francisco
Editor, Robert Sibley.....No. 6 Crossley Bldg., San Francisco
Managing Editor, Willis M. Deming.....No. 6 Crossley Bldg., San Francisco
Business Manager, Willis M. Deming.....No. 6 Crossley Bldg., San Francisco

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)

Technical Publishing Company.....No. 6 Crossley Bldg., San Francisco
E. B. Strong.....San Rafael, Cal.
W. M. Deming.....San Francisco
R. J. Davis.....Ross
Robt. Sibley.....Berkeley, Cal.
A. H. Halloran.....Berkeley, Cal.
Mrs. L. B. Story.....Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of mortgages, or other securities are: None.

WILLIS M. DEMING,
Vice-President & Business Mgr.

Sworn to and subscribed before me this 29th day of September, 1917. (Seal.) M. A. BRUSIE.

(My commission expires September 24, 1918.)

CONTENTS

Industrial Opportunities for Trained Women. <i>By Clotilde Grunsky</i>	343
Why the Shields Water Bill Should Pass.....	346
The Electrical Dealer's Profits. <i>By A. H. Halloran</i>	343
War Problems for Inventive Solution. <i>By John D. Galloway</i>	350
Western Windows That Win.....	352
Selling Electric Washing Machines. <i>By A. E. Kuhnhausen</i>	354
Effect of Losses by Fortuitous Events. <i>By C. E. Grunsky</i>	355
Short Journeys in Pacific Lands.....	356
Silver Lake—Los Angeles Aqueduct Decision.....	358
Suggestions For Contractor and Dealer. <i>By George A. Schneider</i>	361
Furnace Construction in Fuel Oil Practice. <i>By Robert Sibley and Chas. H. Delany</i>	363
Convention of Utah Society of Contractors and Dealers....	366
Sparks—Current Facts, Figures and Fancy.....	369
Editorials	370
Personals	373
Meeting Notices for Electrical Men.....	375
Builders of the West XV. A. E. Chandler.....	375
Convention of National Contractors Association.....	376
Happenings in the Industry.....	377
Trade Notes.....	378
Latest in Everything Electrical.....	380
Good Books and Bulletins for the Engineer.....	382
What Western Inventors are Doing.....	384
New Electrical Developments.....	385

The Liberty Loan

In the good old days of long ago the word "loan" used to mean "a gift or grant by a superior of property to be held of him upon certain conditions." And cannot we, in this larger sense, follow this meaning of many years ago in our subscription to the Liberty Loan? In a word, the superior of property—the spirit of democracy in America—impels us to contribute our gift or grant to be held by the nation at large upon certain conditions, which are that this material symbol of democracy be used to liberate all mankind. A gift or grant under such conditions may then, in words of fiery eloquence, be well and properly defined as a Liberty Loan.

How about your new bond subscription to the gigantic Liberty Loan campaign now raging?

More and more it is being impressed upon the thinking mind that the great world issues now perplexing mankind are to meet their eventual solution by a consideration of the basic economic and technical problems involved.

The Power of Technical Journalism

In view of this fact the influence of technical journalism is each day being raised to a dignity hitherto unexperienced in the evolution of the educational, engineering and industrial activities of the nation. Thoughtful men are looking to the medium of the technical press—unbiased by political or selfish intrigue—as a forum for the expression of their thoughts and a place where scientific and accurate data may be found.

And on the other hand, those who have the privilege of wielding the editorial pen for the technical and scientific expression of the nation realize full well the increased responsibility that is thus automatically added to their burden of written expression.

The Journal of Electricity, now completing a period of thirty years of service in the West, in the prime of its splendid manhood, is fully aware of its added share of serious responsibility thrust upon its shoulders by the exigencies of this recent trend in the evolution of world affairs. As a consequence, it is with a note of pride and of patriotic fervor that the Journal of Electricity informs its readers of its renewed ambition to be an ever increasing factor, no matter how small, in the solving of some of the great world problems now before the nation, with especial reference to the engineering and commercial problems confronting the West and the countries bordering the great Pacific.

In addition to setting forth the current engineering and scientific progress of the day, it will be its

unswerving editorial policy to fearlessly give expression in condemnation, if necessary, to the practices of central station, regulatory commission, engineer, contractor, dealer or technical teacher that should be bettered, and on the other hand to call attention with praise for all commendable features of commercial and engineering life of this great district.

And, so far as strict adherence to the unstinted truth is maintained in this policy, it is believed its sphere of influence will broaden until, like the ripples of water from the sun-kissed shores of the great Pacific, its name and prestige will go forth and be established in every country and clime that line the greatest of all bodies of water—the vast Pacific.

The present progress of the subscription campaign for the second Liberty Loan portends new and hitherto unexperienced successes for the great world conflict. The manner in which this loan is over-subscribed will have much to do with the psychology of winning the war. In other words its crushing effect on the enemy can not be overestimated.

It is not a favor to the government—but a gigantic economy to ourselves that an immediate over-subscription to the present Liberty Loan be made in such proportions as to stagger the former world achievements in finance.

As progress is made in affairs relative to the world crisis, it becomes more and more apparent that never before in the history of the electrical industry did more necessity exist for men meeting together at frequent intervals for the dissemination of important facts and the discussion of problems of mutual interest. The vast complexity and overlapping of activities of the countless engineering and technical societies now existent are, however, daily forcing the conclusion upon thoughtful men that a glaring need for centralization and simplification of the present system is not only desirable but of utmost timely importance, if the engineering and industrial activities of the nation are to be kept in close and harmonious working condition for assisting the national government in the successful prosecution of the war and in keeping these activities themselves in a healthy and normal state.

On the Pacific Coast this critical state of affairs is especially marked. Too many engineering and technical societies are today endeavoring to keep up their organizations and still pay heavy expenditures to the parent Eastern organizations.

Conditions west of the Rockies are still so unique and different in themselves from the main body of engineering and industrial problems met by the nation as a whole, that it would seem the best of good policy to have one Pacific Coast society, committee, or council to properly handle matters of common concern. This clearing house could keep the industry as a whole in touch with affairs of national importance and at the same time deal with emphasis in matters of timely import in this vast district so far removed from the eastern centers.

In the ideal it would seem that one council of this nature could in a suggestive manner, vested perhaps with only powers of an advisory nature, do much toward unifying these paralleling and conflicting interests so that the maximum good could be accomplished with minimum outlay of time and money.

While such action could well be taken for all engineering and technical endeavor on the Pacific Coast, the simpler task would seem first to be that of readjusting and harmonizing the societies that are particularly related to the electrical industry—such societies, for instance, as the various sections of the American Institute of Electrical Engineers, the various sections of the National Electric Light Association, the Jovians, and the several electrical development leagues in various cities of the West.

By a proper and harmonious planning of these activities more good and better helpful results can be obtained than in the rather conflicting scene that presents itself at present to any one who gives the matter thoughtful consideration.

It is to be hoped that all those having at heart a love for efficiency and the saving of waste, among the most important of which is the saving of precious time and energy, will give this matter careful consideration and that early action will be taken by the various engineering and technical organizations of the West, looking to a more effective and harmonious working of all these activities.

The credit for the more active part which women have taken in industry in this above other wars is laid at the door of the electrically driven machine and the ease with which it may be handled. For instance in one munitions plant in Toronto, an electric lathe, operated by a woman, is turning out shrapnel shells at a rate which formerly with other machines, required the attention of six shopmen.

And now the electrical field is feeling the effect of its work. Women chauffeurs are to operate the electric trucks of a large New York concern, they are trained for the operation of electric locomotives, electric elevators and portable electric winches. Indeed, it is difficult to estimate where the boundary may in future lie between woman's work and man's work.

Should the present war continue to be the long drawn out affair some are prone to prophesy, it is not difficult to formulate the early situation in American industries. Even in the West, where intensive industrial life has not as yet been reached, the shortage of men is felt most keenly on all sides.

It is well that women prepare themselves by technical and vocational studies to fill this growing need for trained minds in the industries of the West.

The leading article of this issue of the Journal of Electricity is taken up with a timely and comprehensive discussion of this subject and it is believed that a quiet, thoughtful perusal of its contents will aid much in enlightening engineers and central station men of the electrical industry throughout the West on the present phase of this new and timely aid in national service—women in the industries.

Psychology of Oversubscription in Finance

Too Many Technical Societies

Women in the Industries

Frequent comment has been made in the columns of the Journal of Electricity relative to the giant impetus to the industrial life of Pacific Coast cities that has been given by the present vast ship building now under way in the various ship yards of the West.

Electrical Applications in Ship Building

Only those who have visited these installations can appreciate the innumerable applications of electricity in the tireless tasks that are being accomplished in building the Emergency Fleet for the nation.

As an instance of the large blocks of new power that are being diverted for these uses, a recent contract may be mentioned. This particular firm has been awarded by the United States Emergency Fleet Corporation the building of ten 400-foot steel vessels. Construction work on three of the vessels will start as soon as material and equipment can be delivered on the ground. The initial electrical installation for this plant will be approximately 1600 h.p.

Not only are large blocks of power thus being diverted, of interest to men of the industry, but the actual uses of this power are intensely interesting as indicative of the manifold applications of the modern method electrical.

As recently recounted by an Eastern writer, the inconvenience and waste due to using air tools in the construction of the riveted vessel has long been realized by the practical shipbuilder. Here he welcomes electricity. This is clearly shown by his willingness to introduce electric drilling and reaming. He is eagerly looking forward to a practical electric rivet heater, and hopes to see the air riveter replaced by an electric rivet-hammer. The enlivened interest in shipbuilding in this country will no doubt turn capital and brains towards the solution of these two important problems.

For the suggested welded type of vessel, although other methods of welding steel may be used, the advantages of electric arc welding and "spot welding" will not be overlooked. It cannot be doubted that, as electric power has taken a leading position in this business in the past, it will assume larger proportions in the future despite the development in the method of construction of the steel ship. Truly the electric way is the best way.

In contemplation of this brilliant future for new and important applications of electrical energy, all interested in seeing the great West come into its own in the development of its vast hydroelectric possibilities, gain renewed enthusiasm for the future industrial development of this section of the country.

The recent refusal of the city engineer of San Francisco, backed by the Board of Supervisors and the Mayor, to allow the San Francisco Bureau of Governmental Research to review the present status of the Hetch Hetchy project will meet with considerable disapproval by the engineering fraternity as a whole.

A Review of the Hetch Hetchy

But it must be remembered that the engineer having this project in charge has earned a well-won reputation for creative imagination and has built projects in the decade just gone by that have surpassed similar feats in engineering the world over, and as a consequence he has the respect and confidence of the engineering and commercial world generally. Again, this project has in previous years been reviewed by engineers of world-wide reputation and its good and bad features are largely a matter of record in the proceedings of national engineering societies and are even spread upon the records of the national Congress. But even more important than these arguments is the fact that the engineer of a project of such vast proportions as the one under discussion must of necessity have confidential data that he is entitled to withhold until satisfied with its correctness and until satisfied that the truths conveyed by such confidential information can not be perverted by others not versed in affairs of such magnitude and thus lead to erroneous and disastrous conclusions.

Yet in spite of all these telling arguments, the fact remains that there has been an undercurrent of gossip that has gone the rounds during the past season regarding this great project to such an extent that it has been the subject of comment at the informal luncheon tables of engineers and in the various banking houses of the West.

There is nothing that breeds suspicion and lack of confidence to a greater extent than an apparent unwillingness on the part of public officials to put all the cards on the table. Since time immemorial men of all ages have realized that the force of truth is almighty and it will prevail. Hence no fear of shallow or unjust criticism should be manifested in any project that is sound and well planned.

In view of this fact, and in view of the vast importance this undertaking is to the commercial and engineering future of the West, it is well that the most frank courting of a review of this project by others than those directly interested in its management, be undertaken by those having the giant task in hand. In this way only can confidence be instilled in the public generally, in order that hearty and widespread support be given to a task of such far-reaching proportions.

THE NEW JOURNAL SERVICE: The problems of the electrical contractor and dealer are so interwoven with those of the electrical industry as a whole that it has seemed best to present to our readers, in coming issues, short terse articles that deal specifically with some of these problems, such for instance as how to figure profits, how to take care of overhead, and how to keep accurate data on cost accounting. These articles are being written for the Journal of Electricity by experts who know and they should prove of timely aid to men of the industry throughout the West.

The co-operative spirit of helpfulness that is being manifested by readers of the Journal of Electricity looking toward a successful outcome of the big subscription contest which is being inaugurated November 1st, as announced elsewhere in this issue, is deeply appreciated by the editorial and managerial staff of the Journal of Electricity and it is confidently believed that the New Journal Service of the future will be raised to such a high plane of usefulness as to create a distinct factor in contribution of helpfulness to the Nation in these days of tense industrial activity.

PERSONALS

Ira N. Hollis, president of the American Society of Mechanical Engineers, is expected to visit various cities of the West during the latter part of October. Dr. Hollis is also president of the Worcester Polytechnic Institute, and one of the foremost and best known of the engineering profession in the country. He is an Annapolis graduate of the famous class of 1878 and was one of the active force in building the White Squadron of those days. In addition to his years of service with the Navy he was professor of Marine Engineering at Union



College and held the Chair of Engineering at Harvard University from 1893 to 1913, where he was a leader in the development of the engineering department and also in the promotion of athletics, being chairman of the Athletic Committee for several years. In 1913 he accepted the presidency of the Worcester Polytechnic Institute, which he now holds. His large experiences in the Navy and all branches of mechanical engineering has made his services and advice of great value on the several national boards he has been giving much of his time to during the last two years. A dinner will be given in his honor October 25th, by the Joint Engineering Societies, consisting of the American Society of Mechanical Engineers, American Society of Civil Engineers, American Institute Mining Engineers, American Institute Electrical Engineers and American Chemical Society. A large gathering is expected.

The San Francisco Electrical Development and Jovian League at its noonday meeting of October 24, at the Palace Hotel, will have Dr. Hollis as its guest of honor. Great enthusiasm is being shown in prospective attendance at this informal gathering, which members of all the engineering societies have been invited to attend.

C. E. Patterson, comptroller of the General Electric Co. at Schenectady, is a San Francisco visitor.

H. L. Harkness, electrical salesman with Hughson and Merton, Inc., has returned to San Francisco from an eastern trip.

George H. Scheu, foreman electrician of the Pullman Company at Salt Lake City, Utah, has been transferred to San Francisco, Cal.

Wooster Curtis, of the general office, General Electric Company at Schenectady, together with Mrs. Curtis is a ten-day visitor in San Francisco.

Robert Dickerson Pike, chemical engineer of San Francisco, has recently been elected a member of the American Institute of Electrical Engineers.

A. L. Martin, local manager of the Oregon Power Company at Marshfield, Oregon, has been appointed a member of the Coos County Defense League.

M. C. Osborn, commercial agent Washington Water Power Co. of Spokane, Wash., is expected at San Francisco on October 20th on his return from an eastern trip.

A. H. Babcock, consulting electrical engineer for the Southern Pacific Company with headquarters at San Francisco, is on a two months' visit to interesting Atlantic sea-coast points.

S. G. Jackson, proprietor of the Berkeley Electric Construction Co. of Berkeley, California, has been drafted for army service and leaves for American Lake, Wash., on October 17th.

R. M. Alvord, president of the San Francisco Electrical Development and Jovian League, was a speaker at the recent quarterly banquet of the University of California Extension Division in Berkeley.

S. Allen Dyer, who has been a special representative of the General Electric Co. in Mexico and Central America for several years, was in San Francisco during the past week enroute to Schenectady.

J. A. Cranston, manager of the Portland office of the General Electric Company, and A. K. Baylor, of the general office of the General Electric Company at New York City, are recent San Francisco visitors.

T. C. Roberts, Chief Engineer of the United Verde Copper Company, and of the United Verde and Pacific Railway Company, has just been elected to membership in the American Institute of Electrical Engineers.

W. M. Deming, business manager of the Journal of Electricity, is back again in San Francisco after a week's visit to Salt Lake City, where he assisted in the recent organization of the Utah Society of Electrical Contractors and Dealers.

L. J. Todhunter has been appointed manager of the electrical department of Herr-Rubincam Supply Company, Denver, Colo. He was formerly assistant manager of the electrical department of the Hendrie & Bolthoff Manufacturing & Supply Company.

E. H. Sennott, assistant treasurer of the Metropolitan Building Company, Seattle, for the past eight years, has resigned to re-enter the employ of the Stone & Webster Engineering Corporation, and will go to France as financial director for that concern.

Romaine W. Myers, Consulting and Illuminating engineer of Oakland, gave an interesting illustrated lecture on "Controlled Lights" before the Oakland Engineers' Club in the Commercial Club rooms, Hotel Oakland, on Wednesday evening, October 10th.

Earl Fisher, of the commercial department of the Pacific Gas & Electric Company, is devoting the entire month in assisting the local Liberty Loan Committee in putting over the giant task of placing its share of bonds, the mammoth campaign for which is now under way.

Frank Rieber, chief engineer of the Rieber Laboratories, is back from an Eastern trip and is again in San Francisco where he recently delivered a talk on combating the submarine menace, before the San Francisco Section of the American Institute of Electrical Engineers.

Burwell S. Cutler has been appointed to the position of Chief of the Bureau of Foreign and Domestic Commerce, Department of Commerce at Washington, D. C. Mr. Cutler came into the Bureau six months ago to assist in putting the organization on a thoroughly business basis.

Stanley V. Walton, head of the commercial department of the Pacific Gas & Electric Company, has handed in his

resignation to take effect the first of the year, in order that he may give his entire time to the development of property interests held by his family. Mr. Walton has long been recognized as a potent factor in the electrical industry of the West. In addition to his clean and efficient business methods, his kindly and pleasing personality has won for him a host of friends and well-wishers. It will be with a distinct feeling of regret that



this announcement of his leaving the electrical field will be read by readers of the Journal of Electricity, yet the heartiest of good wishes go with him in his new undertaking.

W. J. Drury has been appointed manager at the Cleveland distributing house of the Western Electric Company. Mr. Drury was formerly sales manager at Dallas and is succeeded by W. P. Hess, who was formerly in charge of the sales work at Houston. Mr. C. W. Chesnut takes Mr. Hess' place.

George E. Kimball, formerly with The Pacific Telephone and Telegraph Company, has been appointed Electrical Inspector in the Safety Department of the Industrial Accident Commission. His appointment was made through the State Civil Service Commission following a competitive examination.

Freling Foster, until recently advertising manager, Hughes Electric Heating Company, Chicago, has joined the advertising staff of The Society for Electrical Development. He will take the place made vacant by the resignation of E. M. Hunt, who has become connected with the "Review of Reviews."

Wm. K. Freudenberger, chief engineer for the Public Service Commission of the State of Nevada, has resigned as his other business matters in Missouri require his attention. F. O. Broili, who has been connected with different power and manufacturing companies of Nevada and Oregon in engineering and managerial positions, has been appointed to fill the vacancy, and will take his new position Nov. 1, 1917.

Clyde B. Aitchison, formerly a member of the Oregon Public Service commission, has recently been named by the President for membership on the Interstate Commerce Commission. For some time Mr. Aitchison acted as attorney for the national organization of state railroad commissioners to represent their interests with the Interstate Commerce Commission, so that he is eminently fitted for the field he is about to enter.

George A. Hughes, of the Hughes Electric Company of Chicago, after taking a most prominent and helpful part in the electric range discussion at the recent Spokane convention, is now sojourning in Southern California. He expects to return east shortly. The many new friends made by Mr. and Mrs. Hughes throughout the West trust that they will again be with us in the early future and that their next stay may be much more generous than the present visit.

Harry Arthur Curtis, power superintendent of the Hydroelectric Dept., Government of Tasmania, Carl Joseph Erickson, engineer for the Western Precipitation Co., Los Angeles, Arthur A. King, chief electrician of the Arizona Commercial Mining Co., Edward T. Nash, electrical engineer of the Butte Electric Railway, Heuchi Nukiyana, of the Tohoku Imperial University, Sendai, Japan, and Robert Reid, electrical engineer with the Sierra and San Francisco Power Co., have been elected associate members of the American Institute of Electrical Engineers.

Harris J. Ryan, professor of electrical engineering at Stanford University, representing the Amer. Inst. of Elec. Eng.; L. H. Duschak, of the U. S. Bureau of Mines, representing the American Chemical Society; C. D. Marx, professor of civil engineering at Stanford University, representing the Amer. Soc. of C. E.; T. A. Rickard, editor of the Mining and Scientific Press, representing the Amer. Inst. of Mining Engineers; and B. F. Raber, associate professor of mechanical engineering at the University of California, representing the local section of the American Society of Mechanical Engineers, are all actively engaged in planning a cordial and hospitable reception for Ira N. Hollis, president of the American Society of Mechanical Engineers, at the Palace Hotel Thursday, October 25, 1917.

OBITUARY

J. K. Robinson, Chilean representative of the Westinghouse Electric Export Company, died at his summer home, Naples, Me., on September 7th after an interesting career in

South American trade. Mr. Robinson was a fellow of the American Institute of Electrical Engineers, a member of the New York Electrical Society, and numerous other professional and social organizations in this country and abroad. He is survived by his wife and one daughter and by his mother.

MEN OF THE INDUSTRY GO A-FISHIN'

O. B. Stubbs and S. W. Peterson of the Stubbs Electric Co. at Portland; C. M. Wills and F. N. Averill of the Forbes Supply Co. at Portland; H. B. Squires of the H. B. Squires Co. at San Francisco; and H. E. Sanderson of the Bryant-Perkins Co. at San Francisco, together with J. G. Little, one guide and a cook went fishing immediately after the recent convention of the Oregon Association of Electrical Contractors and Dealers at Eugene. The north fork of the Willamette River was the location sought by this mighty group of sportsmen. The party was gone ten days, three ducks were killed and 1979 pounds of trout landed. Lack of bait is the reason given for the small catch reported. Further details of the trip can only be secured by personal interview.

NEW GAS RATES OF PACIFIC GAS & ELECTRIC CO.

The maximum gas rate to be charged San Francisco consumers henceforth by the Pacific Gas and Electric Company is 85 cents a thousand cubic feet.

This is the rate fixed by the Railroad Commission in a decision transmitted recently to the company's attorneys and the city attorney's office.

The new schedule follows:

First 10,000 cubic feet a meter a month, 85 cents a thousand.
Next 20,000 feet, 80 cents.
Next 40,000 feet, 75 cents.
Next 80,000 feet, 70 cents.
Next 150,000 feet, 60 cents.

TWO PUBLIC SAFETY HEARINGS

The Industrial Accident Commission has arranged for two Public Safety Hearings to be held in the Underwood Building, 525 Market street (Room 407), San Francisco. The first Hearing is called for Thursday, October 18th, at 10 a.m., to consider Tentative General Construction Safety Orders. The second Hearing will consider Tentative Revisions of Sundry Elevator Safety Orders on Friday morning, October 19th, at 10 a.m.

Similar Public Hearings will be held one week later in Room 405, Union League Building, Los Angeles, each commencing at 10 a.m., the Tentative General Construction Safety Orders on Thursday, October 25th, and the Tentative Revisions of Sundry Elevator Safety Orders on Friday, October 26th.

Two committees prepared the Tentative General Construction Safety Orders, one meeting in San Francisco and the other in Los Angeles.

The San Francisco committee was composed of the following: Sylvain Schnaittacher (chairman), E. T. Thurston (vice-chairman), Louis Bailey, Charles Wright, T. W. McClenahan, H. J. Ralston, Emil Hogberg, J. J. Connolly, Russell Hinton, Paul Ahel, Walter English, Jos. Kiernan, Jas. A. Macdonald, N. H. McLean, William Wolf, Lawrence Flaherty, J. J. Rosenthal, John R. Brownell (secretary).

The Los Angeles committee was selected as follows: J. J. Backus (chairman), G. W. Saurret (vice-chairman), H. M. Scott, A. R. Walker, C. L. Peck, Burdett Moody, A. J. Werner, Erick Lund, W. E. Stradley, J. J. O'Connor, R. L. Mertz, R. D. Bland, M. L. Holmes, H. J. Henry, R. C. Porter, J. H. Williams, C. A. Hanna, L. A. Pockman, H. L. Boyd (secretary).

MEETING NOTICES FOR ELECTRICAL MEN

(Meetings of electrical men throughout the West, though not so frequent as those held during September, continue to bear fruitful results. Especially is this true of the recently organized society of electrical contractors and dealers of Utah, described elsewhere in this issue. The quarterly meeting of the Pacific Coast Electrical Supply Jobbers to be held in Southern California the latter part of this month, as set forth below, is perhaps the most important gathering of the immediate future. Notations on various engineering gatherings and development league meetings throughout the West may also be found here.—The Editor.)

Pacific Coast Electrical Supply Jobbers' Convention

Agreeable to a well earned tradition in cordiality, the forthcoming convention of the Pacific Coast Electrical Supply Jobbers is being planned by president Taylor and secretary Elliot, in truly helpful style. The following invitation is being sent out:

THE TIME: October 25, 26, 27, 1917. **THE PLACE:** Beverly Hills Hotel, Los Angeles. **THE EVENT:** Convention, Electrical Supply Jobbers' Association of the Pacific Coast.

You are invited. You have been with us before, so it is unnecessary to describe the program, both work and play. But in order that hotel reservations may be made and possibly transportation arranged, please make out, sign and return to me answers to the following questions. (Return this letter but be sure and sign.)

Q. How many in your party? (Specify men, women and children.) **A.** ———.

Q. Shall you go auto, train or boat? **A.** ———.

Q. What kind of hotel reservations do you wish? Rates are \$4.00 without bath, \$4.50 and \$5.00 with bath. **A.** ———.

Q. Will you join a party leaving Wednesday night, Oct. 24, Owl or Lark? (Arrangements to be made based on replies.) **A.** ———.

Signature, ———.

Only those answering will be taken care of and receive further notices, so answer the summons or be considered an electrical slacker.

ALBERT H. ELLIOTT,

Secretary.

P. S. Literature on Beverly Hills is being sent you.

California Electrical Contractors and Dealers

The California Association of Electrical Contractors and Dealers is now holding a most successful quarterly gathering at Fresno, detail reports of which will appear later.

A new policy for direct bidding on electrical work has recently been adopted by the Electrical Contractors' and Dealers' Association of San Francisco, Cal. In explaining the new method of operation for members, the association says:

Efforts have been made in the past to impress upon the persons and firms to whom electrical contractors submitted bids for electrical work that such bids represented considerable expense and labor and should be treated as confidential, but for some unknown reason this was not found to be the case.

In line with our past efforts, we find that the only remedy for the situation is to submit our bids to the architect or owner direct at some particular date, time and place. In order that this matter may not be unwieldy to the architect or owner we have limited such bids to \$500 or over, or, in other words, on all electrical work costing \$500 or over the bids shall be given direct to the architect or owner and none other.

Accordingly, no electrical contractor member will submit any bid for electrical work, the cost of which is \$500 or more, except direct to the architect or owner or his representative, who shall set a date, time and place for the receipt of such bids, at which time and place such bids shall be opened. The contract for the electrical work shall be awarded to one of the contractors whose bid has been received at such time and place.

San Francisco Section of A. I. E. E.

Before a crowded hall at the club rooms of the San Francisco Engineers' Club, the first meeting of the fall season for the San Francisco Section of A. I. E. E. was held on Friday, September 28, 1917. The subject of the meeting was "The Civilian Engineer and the War," by J. D. Galloway, and "Engineering Problems of the War," by Mr. Frank Rieber. Mr. Galloway is Chairman of the Committee on Engineering and Inventions of the State Council of Defense, and Mr. Rieber is head of the Rieber Laboratories, now engaged in important Government work.

The discussions of the evening proved highly educative in spreading desirable facts that should be known to any one engaged in attempting to solve the submarine problem. Lars Jorgensen, the president of the section and C. F. Piatt, the chairman of the papers committee, are to be congratulated.

Los Angeles Jovian Electric League

As the forms for this issue go to press, reports come from Los Angeles stating, without detail, that the annual election of officers took place for the Los Angeles Jovian Electric League before the most enthusiastic meeting of the year. C. D. La Moree of the Westinghouse Electric & Manufacturing Co. acted as chairman of the day, who introduced James W. Gerard, former U. S. Ambassador to Germany. A stirring talk was delivered in behalf of the Liberty Loan subscriptions and new ideas for helpful League meetings were outlined, details of which will be published in the next issue of the Journal of Electricity.

BUILDERS OF THE WEST—XV



A. E. CHANDLER

Water in the West is as vital to its upbuilding and maintenance as bread is to the human system. The intricate and diverse laws governing the uses of water that have of necessity grown up about us in the several commonwealths of the West have required the workings of many master minds in their coordination and interpretation. To unravel this tangled mass and to step it down in words that make them available to the needs of man is no small task. To the quiet and retiring member of the California Water Commission, A. E. Chandler—teacher and writer—this issue of the Journal is affectionately dedicated in recognition of his service to the West in the interpretation of water and its uses.

Oregon Society of Engineers

The first lecture of the engineering extension courses by the Oregon Agricultural College was given on Thermics by Prof. Otto B. Goldman, Saturday evening, October 6, 1917 at 8:00 p.m. at the East Side Library, E. 16th and Alder streets.

These courses are of vital importance to the Society and to the engineering profession. The courses are open to non-members, and all are urged to bring their friends.

San Francisco Engineers' Club

The Engineers' Club of San Francisco had a short luncheon talk Thursday, October 11, 1917, at which attorney Edgar D. Peixotto spoke on "Liberty Bonds."

The great event in the life of the club for the season is in preparation for October 25. On that date Ira N. Hollis, president of the American Society of Mechanical Engineers, is to be the guest of honor. As Mr. Hollis is an engineer of international repute and a brilliant speaker, an unusual attendance is anticipated.

San Francisco Electrical Development and Jovian League

On all sides the prevailing spirit of the San Francisco Electrical Development and Jovian League seems to portend an activity for the coming months that bids well to surpass all previous efforts. The new officers for the current term are planning events that will instill such a spirit of helpfulness and co-operation into the League membership as to insure an attendance at the meetings hitherto unaccomplished. The meeting for November 24 will be a notable one. Ira N. Hollis, president of the American Society of Mechanical Engineers, a brilliant speaker and one well-versed in affairs perplexing the industry, will be introduced by John A. Britton, general manager of the Pacific Gas & Electric Company. In addition to the usual attendance of the membership, the electrical and mechanical engineering societies will be urged to attend.

The new officers of the League are as follows:

Officers Elected

President—Robert Sibley, Editor Journal of Electricity.
1st Vice-President, R. E. Fischer, commercial department Pacific Gas & Electric Co.

2nd Vice-President—H. C. Reid, pres. Cal. Ass'n Elec. Contractors and dealers.

Secretary-Treasurer—J. D. Redpath, sec'y Cal. Ass'n Elec. Contractors and Dealers.

Members of the Executive Committee—W. S. Berry, sales manager Western Electric Co.; E. O. Shreve, apparatus manager General Electric Co.

The meeting of October 3rd at which Ambassador Gerard was the speaker of the day was unusually enthusiastic and helpful. And on October 10th the ringing words of John F. Neylan, former chairman of the State Board of Control, in behalf of the Liberty Loan, will long be remembered in its stirring appeal. A. H. Halloran of the Journal of Electricity in expressing the ideal of service most fittingly introduced the speaker.

The Jinks and Smoker to be given by the League on the evening of November 1st at Elks Hall is the talk of the hour.

Annual Convention of American Association of State Mineralogists

The situation with regard to meeting the demand for petroleum products and other "war minerals" is being given careful consideration by many branches of the Federal and State Governments. The annual convention of the American Association of State Geologists has been called to meet at St. Louis, October 8 to 15, for this particular purpose, and in view of the important position which California occupies relative to this matter, Governor Stephens has authorized State Mineralogist Fletcher Hamilton to attend and offer the hearty co-operation not only of the State Mining Bureau, but of the mining public of the State.

It is Mr. Hamilton's intention to particularly emphasize the conditions existing in the petroleum industry in California, where stocks are being rapidly depleted in the face of unprecedented drilling activity and the widespread demand for gasoline and similar derived oil products.

THE CONVENTION OF THE NATIONAL ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS

Ideas of the west have permeated the new Orleans Convention of the National Contractors' Association. As the forms for this issue of the Journal of Electricity go to press special telegraph reports to the Journal of Electricity indicate that a decided victory has been won for the spirit of helpfulness and co-operation so long upheld by W. L. Goodwin and other leaders of electrical thought in the West, as indicated the following message from our correspondent:

National Contractors' Association adopts Goodwin plan without a single dissenting voice. By unanimous vote at its New Orleans meeting October 8 to 13, the National Electric Contractors' Association of the United States enthusiastically adopted the "Goodwin plan" for scientific merchandising together with a new form of constitution and by-laws prepared by a committee consisting of James R. Strong, Earnest McLeary and William L. Goodwin.

Under this new organization plan, the National Association will be kept in the closest possible touch with State



W. L. Goodwin in characteristic attitude when driving home a point

and local organizations, each of which will form a part of the national, and new opportunities will be opened up for the electrical contractor dealer along scientific merchandising lines, which are expected to create a real retail electrical trade among the 30,000 sellers of electrical goods in business today.

Bill Goodwin's address, "The ills in the industry and their remedies through the proposed National Association of Electrical Contractors and Dealers" was the event of the convention. His proposals were spiritedly endorsed by many speakers including Colonel Robley S. Stearnes, president of the National Association, G. M. Sanborn, past president, H. B. Kirkland, Samuel Adams Chase, of the Westinghouse Company, J. Nelson Shreve, Habirshaw Wire Company, and every other man who spoke on the subject.

Nearly four hundred contractors from all parts of the United States attended the New Orleans convention, which besides its record attendance was marked by one of the most elaborate entertainment programs in the association's history, arranged by the local committee, under President Robley S. Stearnes.

HAPPENINGS IN THE INDUSTRY

Sierra & San Francisco Power Company Buys La Grange Plant

The California Railroad Commission has authorized the Yosemite Power Company to sell to the Sierra & San Francisco Power Company of San Francisco for \$450,000, plus the cost of additions and betterments from Dec. 1, 1916, its electric production, transmission and distribution property and utility business known as the La Grange division. The property sold consists of a water right on the Tuolumne River near Indian Bar, a water conduit 17 miles (27.37 km.) long and a 900-k.w. hydroelectric plant at La Grange, a transmission and distribution system and the electric lighting and industrial power business in Stanislaus county, east of the San Joaquin River, south of the Tuolumne River and north of the Merced River, including the towns of Turlock, Denair, Ceres, Hughson, Hickman, Waterford and La Grange.

Electric Power for Mining

The mining interests centering around Jerome, Arizona, have been assured an adequate supply of electric power for the immediate future through the opening of the new electric plant of the Arizona Power Company at Tapco. The plant represents an investment of \$800,000. It is provided with three large steel storage tanks for oil, which is used as fuel; one tank provides sufficient storage for the operation of the plant for fifteen days with a continuous output of 5,000 kilowatts. The two auxiliary tanks provide storage sufficient for a twelve-hour run of 6,000 kilowatts current output. The water supply is from the Verde River on which the plant is located. The plant is equipped with four oil-fired boilers, each with a rated capacity of 767 horsepower, two Worthington duplex oil pumps, a single unit turbine engine, generator, and exciter, made by the General Electric Company, and four transformers of 6,000 kilowatts capacity. Power is transmitted over the company's general lines at 45,000 volts to the various substations.

Increased Demands for Power in Nevada

The Nevada-California Electric Corporation reports that the demand for service during the summer has necessitated planning for the installment of two new plants and the enlargement of two of their present plants. The company's Barstow extension now under construction is expected to be ready for operation the first of November. The high price of silver and increasing demands for power, are helping the company in Nevada and considerable developments in the mining of tungsten near Bishop, Cal., are proving of advantage. Business throughout the territory is good, with the exception of the Riverside-Redlands district where next winter's oranges were ruined by the excessive heat.

Electricity's Service in War Times

The Pacific Power and Light Company has found ten different ways in which it is helping to win the war. It furnishes electricity to shipyards and to manufacturing establishments turning out products for war purposes. It furnishes water and light for public buildings and cities. It helps in the transportation problem and makes communication possible in its district by means of the telegraph and telephone. It furnishes power for wireless stations. To help the food supply, it supplies power to flour mills, canneries and drying establishments. It provides the motive power for irrigation pumps and later helps to preserve the products grown on irrigated soil by furnishing energy for refrigeration plants.

Decision on Collisions Between Street Cars and Automobiles

A case of considerable interest to street railroads in the matter of collisions between street cars and automobiles at street crossings was decided by the Supreme Court of California, Department No. 1, on April 20, 1917 (S. F. No. 7251).

The case is known as Arnold et al. v. San Francisco-

Oakland Terminal Railways and was tried in the Superior Court of Contra Costa County at Martinez, California. A \$30,000 verdict was rendered by the jury.

It involved in its determination the question of the negligence of the street car company and the contributory negligence of the automobile driver, together with a discussion of the last clear chance doctrine as applied to such collisions.

Of great significance is the language of the Court bearing upon the respective obligations of the motorman and the automobile driver in the discussion of the last clear chance principle. It was pointed out by the Court that a street car cannot go upon the street except upon its rails and hence that it has the better right to that space to which others must yield when necessary; that it was the duty of the automobile driver upon approaching the crossing to give way to the street car which was about to pass at the same time, if, to avoid a collision, it was necessary to give the right of way to the street car, since the automobile driver could do so and the street car could not; that the motorman of the street car was not required to presume that the automobile driver would not perform this duty, but had the right to presume that he would stop or turn aside; that so long as it appeared that the automobile driver with reasonable care could stop his automobile or turn it to one side or the other so as to avoid a collision and there were no obvious indications that he might not do so the motorman had the right to assume that the automobile driver would do so and upon that assumption could proceed along the track.

The decision would seem to place squarely up to the drivers of automobiles the obligation to turn out of the way or stop and so provide to the street car the right of way where any danger of collision might result from an attempt to force upon the street car a right of way to the automobile.

Utility Asks for Rate Increases

The Pueblo Gas & Fuel Company has filed a petition with the Colorado Public Utilities Commission for rate increases. The company asks that it be allowed to abandon the "dual" meter system and charge one rate (\$1.10) for gas for illuminating or fuel purposes. The petition also contemplates increases of 5 cents per 1000 cu. ft. (145.2 cu. m.) in gas for industrial purposes, and from \$1 to \$1.20 net for gas sold through prepayment meters. If granted, the new rates will increase the company gross revenues about 8 per cent, and also reduce operating expenses materially through abandonment of the dual meter system.

Range Sales Increase

In spite of three increases in prices of ranges during the current year, the Pacific Power & Light Company has sold more than 113% of the number of ranges connected to its lines a year ago.

Comparative Costs of Electrified vs. Steam Roads

The Chicago, Milwaukee and St. Paul has electrified four hundred and fifty miles of its lines from Harlowtown, Montana, to Avery, Idaho, and has under present construction an electric installation which will carry it from Avery to Seattle, five hundred miles more. It has been found, concerning the four hundred and fifty miles already under electric operation, that against a cost of \$1,750,000 for coal from its own mines it costs the company now but \$550,000 a year to operate the line with electricity. Furthermore, under the old system one-third of the road's equipment was requisitioned for coal-hauling purposes.

New Railway Electrification

The Salt Lake, Garfield & Western has completed plans for the electrification of its line and work on the project has already been started. The approximate cost of the work will be \$250,000.

Joint Pole Progress

Since the inauguration of the San Francisco Joint Pole Agreement in April, 1916, the Pacific Gas and Electric Company has combined equipment with member companies on 1602 joint poles. This has resulted in reducing the number of poles on the streets by 2217.

New Insulator Tests

The Pacific Gas and Electric Company is at the present time engaged in taking down and testing every one of the large insulators on the 60,000-volt system of feed wires between Santa Rosa and Petaluma, and a crew of fifteen men, some from headquarters and some from the local district, are now engaged in the work.

New Cars for Honolulu Trolley System

To facilitate the transportation of a constantly increasing number of passengers over the trolley lines of the Honolulu Rapid Transit & Land Co., 10 new cars to cost in the neighborhood of \$80,000 have been ordered from an American mainland manufacturer and are expected in Honolulu within three months.

Gas Company Denies Competition with Electricity

A motion to dismiss the complaint of the North Coast Power Co. has been filed with the Public Service Commission by the Portland Gas & Coke Co. of Portland, Ore. The power company under the certificate of public necessity act passed by the last Legislature, is endeavoring to restrain the gas company from entering the Tualatin valley as a competitor, contending that the territory, so far as heat and light are concerned, is now adequately served. The gas company contends that gas and electricity are not competing commodities in contemplation of the act.

Power of City Regarding Electrical Inspection

In determining whether a city council's delegation of duties and powers as to electrical equipment was warranted, the controlling consideration is not that the power may be unreasonably or oppressively exercised, since every presumption is that it will be honestly and reasonably exercised, according to the Supreme Court of California (166 p. 348). A Pasadena ordinance requiring repairs to electrical equipment in private houses on written notice of the city electrician, if he determines that the equipment is dangerous to life or property, without specifying the tests by which he shall determine such question, is not void as unwarrantedly conferring upon the city electrician judicial or legislative powers, nor because its terms are indefinite, arbitrary or oppressive. Although in equity the court in making its decree adapts its relief to the state of facts existing at the close of the litigation, where an ordinance the enforcement of which it is sought to enjoin is amended so as to confer a right of appeal from the city electrician to the council, the plaintiff's mere failure to appeal does not foreclose his right to resort to the courts to restrain enforcement of the ordinance on the ground that it is void.

Suit Against Accident Commission in Washington

A suit has been started in the superior court of Thurston County by the Washington Water Power Company of Spokane against the industrial insurance commission of the state to restrain it from collecting premiums either for the first aid or industrial insurance on the ground that the last legislature in enacting the law to exempt steam roads by virtue of the fact that they do interstate business, included electric lines doing an interstate business.

TRADE NOTES

New Power Loads

The Municipal Railway of San Francisco has begun operations on the new Church Street line and is running thirty cars, requiring 800 k.w., and the older lines have increased their demands so that the total railway load has increased from 55,000 to 92,000-kilowatt hours daily, or a 60 per cent increase. To insure continuous service the feeder to the Twin Peaks Tunnel was tied to the Church Street line, another feeder was doubled in size, additional taps were installed on Geary Street, and the extension of the 11,000-volt line to the new Station "E" was rushed to completion so that the new station could pick up its share of the load.

The 2400-volt service to the Pelton Water Wheel Works at Nineteenth and Harrison streets is nearly completed and when finished will provide for 300 horsepower at 240/480/2400 volts, three-phase.

New business in prospect for the Arkansas Valley Railway Light & Power Company at Pueblo, Colorado, includes 200 horsepower in motors for the Empire Zinc Company at Canon City, which is enlarging its plants.

The Richmond Division of the Western States Gas & Electric Company has connected an additional installation covering 25 horsepower in motors for Marsh Brothers' Paint Plant.

The National Carbon Company (American Ever Ready Battery Company) at Eighth and Brannan streets, San Francisco, is now being taken care of in their new plant, 200 h.p. and 2000 lights.

The Pacific Sugar Corporation has recently completed a very large sugar factory on the Whitehall Estate, in the near-neighborhood of Tracy, in San Joaquin county. This sugar factory is modern in every respect and it is expected to be in operation in time to handle this year's crop of sugar beets. Contracts have been signed with the Pacific Gas and Electric

Company for electric service to the extent of 150 horsepower.

The National Ice Company, Fifteenth and Alameda streets, San Francisco, has recently decided to replace the steam engines at present operating its ice-making machines with electric drive operated by a 350-horsepower motor. The operation is one of twenty-four hours per day, three hundred and sixty-five days in the year, and it is predicted the installation will be successful in every particular.

The Lide Air Products Company is operating a plant at Emeryville, Cal., for the manufacture of carbide and kindred chemicals. The plant is being operated night and day with an installation of approximately 300 horsepower.

The Moran Company, meat packers, is now engaged in erecting a large cold storage and meat-packing establishment in South San Francisco, which will be completed some time this fall. Total installation amounts to approximately 300 horsepower.

Electrical Activities Due to War

It has become a habit of the Union Iron Works to call frequently for additional power. The Pacific Gas & Electric Company have just provided for another 200 h.p. increase, making a total of 400 horsepower added recently.

The Spring Valley Water Company has requested service to the extent of 250 horsepower for pumping purposes to supply water to Camp Fremont, the new army cantonment at Palo Alto.

The Pacific Coast Steel Company, operating in South San Francisco, is today one of the most important of California's manufacturing industries. The Pacific Gas & Electric Company has been called upon to supply an additional 2000 horsepower, making a total installation of approximately 5000 horsepower. A detailed write-up with numerous views is now being prepared, and will be published in this magazine within the next few months.

One Seattle firm reports a large order from the cantonment for wire sockets, lamps and fixtures for the Y. M. C. A. building under construction; also several orders from Portland district for electric ranges for apartment houses totaling nearly \$10,000.

The Astoria Pulp & Paper Company is installing 20 horsepower in motors in three units, purchased through the Pacific Power and Light Company at Portland; McEachern shipyard is now installing over 100 horsepower; Wilson shipyard about 200 more; Geo. F. Rodgers & Company, 275; Astoria Flour Mill about 150; Far West Milk Company about 50, besides other small installations.

Changes in Personnel

The many friends of Tom Finigan, Pacific Coast representative in San Francisco for the American Brake Shoe Foundry, will be interested to hear that he has gone to Chicago to take a position as acting vice-president of the American Brake Shoe Foundry. He will be the chief executive of this company west of Chicago and also have charge of sales and operation, including five manufacturing plants west of Pittsburg. Mr. U. J. Mulligan, formerly assistant to Mr. Finigan, will take his place in San Francisco.

Stanley & Patterson Company, Inc., of New York City, placed their Pacific Coast Agency in the hands of H. B. Squires Company. In addition to the well-known Faraday bells and Stanley & Patterson specialties, this line now includes the P R bells and a very complete "Quality First" De Veau telephone apparatus and specialties.

Incorporations and Changes

The Automatic Controller & Manufacturing Company of Ogden, Utah, has been incorporated with a capital stock of \$100,000 to manufacture electrical and other machinery. The company will take over the patents granted to Cleveland Redfield. The officers are: Cleveland Redfield, president; J. W. O'Brien, vice-president; William J. Stone secretary; Thomas Q. Whitehill, treasurer.

In order to adequately take care of the growing demands of the business in the Northwest the warehouse and sales-office of the Western Electric Company has just moved into new and commodious quarters at 84 Marion street.

The Bridgeport Brass Company of Bridgeport, Conn., announces the removal of its New York office to suite 2236 Woolworth Building, 233 Broadway, where more commodious quarters have been provided. The telephone number, Barclay 6440, remains unchanged.

It is rumored that the Blaw-Knox Company of Pittsburg is contemplating erecting a factory in the San Francisco district at an early date for the manufacture of transmission towers for high tension transmission lines and other specialties carried by that company.

The Salt Lake & Ogden Railway Company, operating between Salt Lake City and Ogden, has changed its name to the Bamberger Electric Railroad Company.

Demands for Electrical Equipment

The Inland Electric Company, 1011 Sprague street, reports a brisk demand for chandeliers and fixtures for the many modern homes that have been erected in Spokane this year. The company has also just completed installation of a master and secondary clocks for the Standard Electric Time Company in the North Central high school.

Fairbanks-Morse Company, Spokane, was awarded contract for the major portion of the equipment, including gas engines, exciter sets and storage tanks at \$9,380 for light plant to be installed by Harlem, Mont. The Electric Construction Company of St. Paul was awarded contract for pole line and switch board, also commercial and street lighting circuits.

Work on the Down-Town Triangle lighting system for San Francisco has commenced. There are to be 128 ornamental standards, each having two lamps equipped with special glassware, the whole making an appearance similar to the "Path of Gold" lighting on Market street.

Electricity on the Farm

A campaign on farm lighting systems is being waged in the Northwest at carnivals and fairs, bringing excellent results. Inquiries are pouring in. Stocks are ample and shipments are satisfactory.

In an article on the subject by P. N. Bernard, in a Kalispell paper recently, the following paragraphs appeared:

"Flathead County has lost this year through drought more than the installation of electrical energy on our farms would cost. The alfalfa crop in the Flathead is thoroughly established as well as sweet clover and red clover. The feeding values are also established. These are no longer problematical. The Flathead is gradually, yes, rapidly, going into alfalfa. This means dairying, stock raising, diversified and intensified farming. It means that farms are going to raise double the amount and that there need be no short crops. The power lines will be extended into the county seven and one-half miles into townships 28 and 29, range 22. The motors will range from five to twenty horsepower in size. The five horsepower motor, wiring, etc., will cost the farmer for installing \$400 to \$500, and the 20 horsepower possibly \$1,000.

"Flathead County this year would have saved the price of installation on its ranches had they had irrigation. I believe this is the most important development step taken in this county."

The Farm Land Investment Company is now engaged in the cultivation of approximately 3000 acres of rice in the vicinity of Arboga, Sutter County, California. Electric power is used for pumping water to the extent of approximately 700 horsepower.

Washing Bottles by Electricity

The sales department of the Pacific Gas & Electric Company has recently made a very interesting installation of electric water-heating at Napa Soda Springs. There has been installed a bottle-washing machine manufactured by the Yundt Company of Milwaukee, which consists of a large steel tank approximately seven feet square, thoroughly insulated with Sil-O-cel brick and cement. In this tank are two compartments, and an endless chain arrangement by which the bottles are carried down into first one compartment and then into the other; they are then dropped onto an inclined steel apron which leads to a revolving brush for cleaning the outside, after which they are placed in the rinsing machine, which shoots a stream of cold water into each bottle. The machine is operated by a one-half h.p. motor, and the water is maintained at a temperature of 120 to 140 degrees F. by two Kercher automatic circulation-type heaters of 6 kw. capacity each. The machine is capable of washing 1600 bottles per hour, and the current consumption will run approximately 4000 kw. hours per month. This method of heating requires no attention whatever, and is giving the most perfect satisfaction.

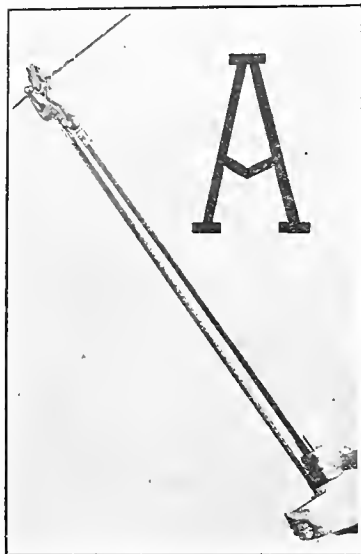
Action Against the Puget Sound Traction L. & P. Co.

A second action has been brought by the city of Seattle against the Puget Sound Traction Light & Power Company in an effort to compel the company to comply with its franchise obligations and pave its right of way in streets where the remainder of the surface has been paved. A similar suit instituted several months ago and argued before Judge McIntosh, resulted in the handing down of a memorandum opinion by the court declining to issue an order pending action by the state public service commission on a petition filed by the company more than two years ago, asking to be relieved of the paving as well as other franchise obligations.

LATEST IN EVERYTHING ELECTRICAL

(The tapping of hot wires has been a fruitful source of accidents in the past—and consequently has constituted a problem of some moment in the industry. Below is a recently perfected device for accomplishing this safely. Mention is further made of other electrical devices recently introduced upon the market.—The Editor.)

A NEW DEVICE FOR TAPPING HOT WIRES



Tapping Machine in Operation

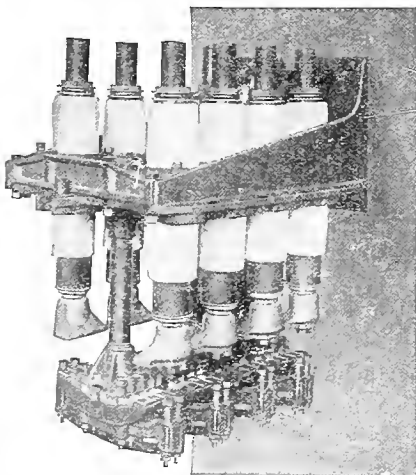
A new departure from all previous hot tapping devices has recently appeared in the trade. All that is necessary to make a tap is to take a piece of No. 6 or No. 8 annealed copper wire, tap one end of wire to the dead branch line by hand, feed the other end into the machine, shove the machine up and on to the hot main-line wire at the point desired, turn the crank at the bottom of the insulated handles until all the wire is wound on to main line wire, then reverse the direction of crank, turn backward until the machine stops; pull machine away from main line, and the tap is made.

The machine wraps the tap wire around the main line wire just like a man would do it by hand if the line was dead. The position of man while doing the job is well below all hot wires.

The device is the invention of H. B. Bush of Redlands, California.

PIPE OR WALL-MOUNTING BRACKETS FOR PANEL-MOUNTING OIL CIRCUIT-BREAKERS

Oftentimes a user will have a spare panel-mounting breaker that will just fit his need in a new installation except that he must



mount it on the wall or on a pipe frame. Or a standard breaker for panel mounting may fit the requirements of capacity and method of trip better than the standard pipe or wall-mounting breaker. To enable the panel-mounting breaker to be mounted on the wall or on a pipe frame, the Westinghouse Electric and Manufacturing Co. is making a line of special brackets which

are described more fully in their new bulletin on "Oil Circuit-Breaker Accessories."

TWO-BEARING, THREE-UNIT MOTOR-GENERATOR SETS

Two rubber manufacturing companies in Ohio have each recently installed two three-wire, direct-current motor-generator sets that in construction are a departure from the usual

practice. Instead of being of the old four-bearing, three-unit type or the two-unit type with a three-wire generator as one of the units, these sets consist of three units with only two bearings.

These sets, which were designed and built by the Crocker-Wheeler Company, Ampere, N. J., consist of a 845 k.v.a., 2200-volt, 60-cycle, 3-phase synchronous motor driving two 250-k.w., 125-volt compound-wound interpole generators.

The use of three units results in greater unbalance overload capacity and greater flexibility of the direct-current voltage than is obtainable with a two-unit set having a three-wire generator as one of the units.

As compared with the old four-bearing, three-unit construction these two-bearing units are much simpler in construction and have the following advantages: The absence of outboard bearings makes the brushes more accessible for adjustment and the unit can be assembled, dismantled and cleaned more readily. Perfect bearing alignment can also be secured with greater ease as self-aligning bearings are used. The machines can, hence, be erected with less labor. Because of the shorter length of the set less floor space is required. Couplings which in some cases constitute a weak link are eliminated.

NEW USES FOR THE HEDLITE HEATER

In following up the policy of "localizing heat" adopted by the Hotpoint Electric Heating Company, when they introduced their Hedlite Heater to the trade, they have recently secured contract through the lighting company in Los Angeles, Cal., covering the installation of 30 of their Hedlite Heaters in the Tuberculosis Sanitarium of Independent Order of Foresters in Lopez Canyon, a short distance from Los Angeles.

These Hedlite Heaters will be installed, without the stands, on the under side of the table in the dining room, radiating the heat downward to strike the floor and be radiated up; by this means keeping the bodies of those at the dining table warm, rather than attempting to heat all the air in the room. In other words, they heat the individual instead of heating the room. Inasmuch as the diners will only be in the room 20 minutes, or half an hour during meals three times a day, it seemed unnecessary to attempt to heat the entire room, accommodating over 100 people, when it would only be occupied this short period of time.

SYNCHRONOUS MOTORS DRIVE CITY WATER PUMPS

Water-pumping, on account of its high load-factor, is a load which many central stations have found profitable. One of the more recent installations of this character is that supplied by the Camden Iron Works for the Del Air plant of the Camden, N. J., water-supply system. This consists of two pumps having a total capacity of 10,000,000 gal. per 24 hours.

A neat brick building houses the apparatus which is placed about 12 ft. below ground level. There are two 12 in. centrifugal pumps, double-suction, single stage, each connected through a horizontal shaft to a 200 h.p. Westinghouse synchronous motor. There are also two rotary vacuum pumps each connected to a 10 h.p. Westinghouse induction motor.

Power for this station is received from lines of the Public Service Company at 2200 volts, and used in the main pump motors at this voltage. Transformers are provided to serve the vacuum pumps at 220 volts, and for lighting purposes.

All the electrical equipment in the new station was furnished by the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa.

A NEW SMALL SQUIRREL-CAGE INDUCTION MOTOR

A new line of induction motors has been recently placed on the market by the Crocker-Wheeler Company, Ampere, N. J. These motors, known as the C-W Form P motors, are of the squirrel-cage type, ranging in size from one-half to three horsepower, and are designed for constant-speed operation on sixty-cycle polyphase circuits.

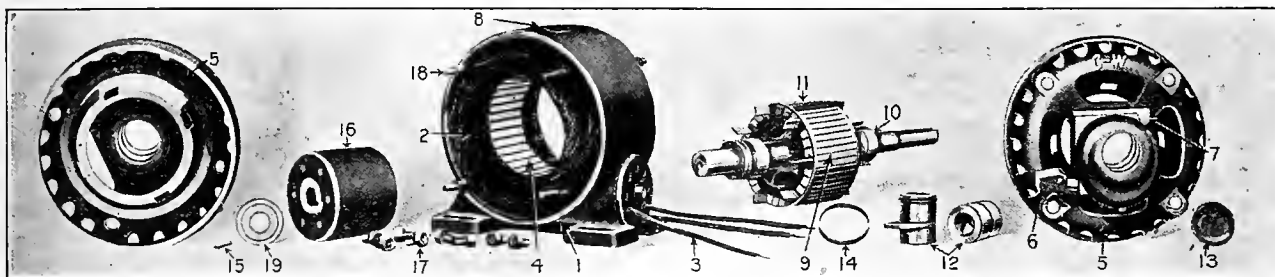
The mechanical construction of these motors is compact, rugged and simple. Rigid frames and end shields, liberally designed shafts and bearings, ample air gaps and good insulation enable these motors to withstand the severe service met with by this type of motor.

Good starting torque and high power-factor are among

From the Railroad Commission: Max Thelen, president of the Railroad Commission; Edwin O. Edgerton, commissioner; Frank R. Devlin, commissioner; Alexander Gordon, commissioner; H. D. Loveland, commissioner; Douglas Brookman, attorney; Richard Sachse, chief engineer; L. R. Reynolds, chief auditor; Frederick O'Brien, recorder of the commission.

From others formerly associated with the commission: J. T. Shaw, attorney Pacific Telephone & Telegraph Co.; R. A. Thompson, director of the valuation of the interstate commerce commission of the Western Division; Allan Matthew, attorney Western Pacific R'y; Harvey Sanborn, rate expert and attorney; Arthur Kelly, consulting engineer; Arthur Roehl, railroad expert and attorney; Paul A. Sinshemer, former bond expert of the Railroad Commission.

Registration may be made at 62 Post street, Room 330, in San Francisco.



Detailed View showing the Nineteen Parts that Comprise the New Motor

the electrical features of these motors, the long and successful experience of the Crocker-Wheeler Company in designing and building motors for application to all classes of service resulting in this design of motor in which the electrical characteristics are combined in such a way as best to meet the requirements of small-motor applications.

Slotted feet cast integral with the stator frame facilitate accurate belt-tension adjustment.

NEW OIL CIRCUIT BREAKERS

To their well-known line of type B oil circuit breakers, the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., have added the two types of breakers illustrated. These are designated as type B-2 and B-3; they are for use on alternating current circuits up to 23,000 volts. Type B-2 breakers have a carrying capacity of from 300 to 2000 amperes; type B-3 of from 300 to 1200 amperes.

Distinctive features of this line are rigidly clamped porcelain pillar bushings, self-cleaning butt brush contacts, auxiliary arcing contacts and spring-accelerated opening. Due to careful design, these are the most compact single-frame breakers produced.

Type B-2 breakers are furnished for panel-mounting, hand-operation, or for wall or pipe-frame mounting, electrical operation. Type B-3 breakers are furnished for wall or pipe mounting only, for hand operation through bell cranks, or for electrical operation. For both types, tripping may be either automatic or by hand.

A NEW UNIVERSITY EXTENSION COURSE FOR UTILITY MEN

An extremely interesting university extension course for public utility men has just been prepared by the Extension Division of the University of California. The course is being given under the leadership of Paul Sinshemer, formerly connected with the California Railroad Commission and a well-known figure in the utility life of the West.

The course will consist of lectures and discussions on financial, legal, engineering, administrative, rate and accounting methods, under commission regulation.

The list of prospective speakers contains the following names:

GOVERNMENTAL ENGINEERING POSITIONS OPEN

The following calls have been received from the Government by the Intercollegiate Intelligence Bureau at the University of California, Berkeley. If you are interested, kindly communicate with the Bureau immediately.

Call 53, Assistant Engineers in Forest Products. Service in the Department of Agriculture. Salary: \$1200 a year, or more. Applicants must be graduates in mechanical or civil engineering and should have had several years' experience in the drying, treating, or testing of wood.

Call 54, Physicists for Forest Service, Department of Agriculture. Salary: \$1200 a year. Applicants must have special training and experience in physics and should have had several years' experience in drying, treating, and testing of wood.

Call 55, Engineer in Forest Products, Department of Agriculture. Salary: \$1800 a year, or more. Applicants must be graduates in mechanical or civil engineering and should have three or more years' experience in forest products research such as drying, treating, and testing of wood.

Call 56, Mechanical Engineer for Forest Service, Department of Agriculture. Applicants should be graduates in mechanical engineering with experience in kiln drying of lumber.

Employment in the case of the above four calls will probably be in laboratories at Madison, Wisconsin, with comparatively little field work. The posts are for the duration of the war and possibly longer, but no assurance can be given concerning the tenure of office. Appointments will be made under the rules of the Civil Service Commission.

Call 63, Electrical Engineers. Salary: \$3,000 a year. These men are wanted to enter the Navy, with commissions of lieutenant, junior grade. They must be technical graduates and must have had at least three years in manufacturing, testing, and designing. The men will be subject to detail on battleships, in navy yards, or elsewhere. The work will all be in the field and not in the office.

GOOD BOOKS AND BULLETINS FOR THE ENGINEER

Operation and Maintenance of Irrigation Systems

By S. T. Harding, Assistant Professor of Irrigation at University of California. Published by McGraw-Hill Book Co., Inc., New York. Size 6x9 in.; 271 pp.; cloth binding; illustrated. For sale at the Technical Book Shop, San Francisco. Price, \$2.50 net.

This book discusses the operation and maintenance of irrigation systems under the following general chapter headings: Maintenance of Canals; Maintenance of Structures; Organization; Methods of Delivering Irrigation Water; Measurement of Irrigation Water; Rules & Regulations; Payment for Construction and Operation Charges; General Operation; Accounts.

The preface states, "The subject of this volume is necessarily one of practice rather than of theory. As in other similar subjects, practice is materially affected by local conditions, which in irrigation may vary widely in the different irrigated sections. Such variations make it difficult to distinguish the principles of the practice from the local application of such principles. An attempt has been made to give the general principles that may be recognized, illustrated by typical examples of their local application, rather than to fully cover all local variations in practice."

The author has contributed many articles to the columns of the Journal of Electricity on the subject of operation and maintenance of irrigation systems. He is a well known irrigation investigator with the faculty of the University of California. This book should receive an immediate and hearty reception among all engineers interested in the subject matter it contains.

Street Railway Fares

By Dugald C. Jackson, Professor of Electrical Engineering and David J. McGrath, Research Assistant in Electrical Engineering at the Massachusetts Institute of Technology; size 6x9 in.; 169 pp.; published by McGraw-Hill Book Co., New York City, and for sale by the Technical Book Shop, San Francisco. Price \$2.50.

That the flat-rate fare system as used on practically all of the street railway lines in this country is an inheritance from the horse-car days is the conclusion reached by Professor Jackson and Mr. McGrath after an exhaustive study of electric railway traffic and fares throughout the country. The book is in effect Bulletin No. 14 of the Massachusetts Institute of Technology, being the report of an investigation carried on in the research division of the Electrical Engineering Department of that college. Briefly, the problem as presented here is as follows:

1. The owners of street railway systems are entitled to just treatment and equal protection by the laws and no more.
2. Many companies are not earning a fair return at the present time, operating upon the usual 5-ct. fare basis; others are obviously making ample earnings.
3. Attempts to meet increased costs by increasing unit fares to 6 cts. or more have resulted in reduction in passenger traffic.
4. To meet increasing costs of service and to properly prepare for extensions of existing systems, the street railways in the United States will sooner or later be forced to adopt a system of rates based more nearly on the length of haul.

The material has been presented with the aid of tables and charts so that the data and conclusions are readily available to street railway officials and municipal officers.

The Principles of Airography

By Alexander McAdie, Professor of Meteorology, Harvard University and Director of the Blue Hill Observatory; size 6 by 8½ in.; 318 pp.; published by Rand McNally and Company of Chicago, Ill., and for sale by Technical Book Shop, San Francisco. Price \$3.00.

For the layman as well as to the student of meteorology, the science of the air has its fascinations—and these are apparent in Professor McAdie's extremely readable as well as scientific presentation of the subject. Much new material

in connection with the exploration of the upper air has accumulated since the latest textbook on meteorology has been published in this country and this has been included in the present work in convenient and condensed form. The book further emphasizes the use of the new c. g. s. system of units, classifies clouds according to origin rather than appearance, and furnishes studies of ice storms, snowfall equivalents and water supply. Useful charts of flood occurrence and others for the special use of aviators are included. In more than one respect, the book is distinctly a pioneer in its field.

The author, who for so long a period occupied the head position in the U. S. Weather Service with headquarters at San Francisco, is well known to engineers and men of the electrical industry of the West. The book should receive a cordial welcome by all interested in this new and promising field of knowledge.

BULLETINS

New Electrical Appliances

The Hotpoint Electric Heating Company has recently sent to the trade an unusually attractive piece of publicity showing the electric appliance as an aid to Red Cross work.

In a little leaflet entitled "A Plea for Safety," the Detroit Fuse & Manufacturing Company has recently set forth why "Square D" Steel Enclosed Switches are to be preferred.

The Bryant Electric Company of Bridgeport, Conn., has issued a series of beautifully printed booklets on several of its products, including flush heat control, bayonet sockets, canopy taps, "Spartan" receptacles and sockets for candle fixtures.

Westinghouse Electric Ware—electric heating and cooking appliances, such as flat-irons, toaster stoves, percolators, milk warmers, radiators, immersion heaters and solder pots are described in Catalogue 8-C just issued by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa. The "Sew-Motor" for sewing machines is also described.

Upbuilding the Electrical Industry

The Industrial Accident Commission for its September issue of the Safety News contains a very beautiful and comprehensive description of the Safety Museum located on Market street in San Francisco.

The Public Service Commission of Oregon has published an appraisal and report on the electric and water utilities of the City of Eugene, this making of a report on a municipal plant over which they have no jurisdiction representing a new departure in their practice.

The Western Electric Company in accordance with its broad policy of selling the electrical idea is placing a large quantity of forceful advertising in popular magazines in order to assist the electrical contractors in their various campaigns. In the Habirshaw matter attractive displays of the wide uses of household appliances are made.

Believing that the advertising problem is not to sell an industrial plant manager Westinghouse Mazda lamps, but rather to overcome his indifference to the general subject of lighting, the company has prepared two books in which lighting is almost a secondary consideration. In other words, the company has endeavored to treat with the problems of the industrial plant manager and show in a logical way the relation of good lighting to those problems. The ideal in view is a most commendable one as is the matter contained in the publications referred to.

Helping to Win the War

The Society for Electrical Development announces that there will be no National Electrical Week Celebration this year, owing to war conditions.

Attention is called to Food Pledge Week beginning October 14 by a recent Bulletin of the Public Information Division of the United States Food Administration.

Literature covering the recent War Convention of the Chamber of Commerce of the United States is being circulated by that body.

"The Effect on Business of Recent Statutes" is the title of War Bulletin 19 of the Chamber of Commerce of America. The regulation of the food, feed and fuel industries is here discussed.

How a Gas and Electric Company can help the problem of food conservation by giving space to Government exhibits is told in a Bulletin Vol. I., No. 5 issued by the Trade and Technical Section of the U. S. Food Administration, Washington, D. C.

New Electrical Apparatus

Bulletin 182 of the Crocker-Wheeler Company contains a brief description of their new Form P Induction Motors.

A new sixty-four page bulletin has been received from the Sprague Electric Works describing and indexing their panel boards and cabinets.

The Barnes Lindsley Manufacturing Company of Portland, Oregon, have recently issued a booklet on Douglas Fir Cross-Arms, not only setting forth the values of their own product, but also giving important information as to the tests used in inspecting such work by the U. S. Government.

"Phono-Electric" Trolley Wire applications throughout the traction world are handsomely illustrated and interestingly described in Bulletin Ten from the Bridgeport Brass Company of Bridgeport, Conn. Special emphasis is placed on its dependability.

Hubbard & Company have issued a supplementary bulletin to their general catalogue fully illustrating and describing Peirce Presteel Racks and Brackets. The universal dead ending clevis designed by L. M. Klauber of San Diego is one of the several devices shown.

Bulletin 610 from Edison Storage Battery Company, attractively portrays the use of Edison storage batteries in lumber transportation. In addition to the description of the construction and care of the battery it presents illustrated descriptions of lumber tractors, industrial locomotives and surface carriers in many mills throughout the country.

"Wire in Electrical Construction" with a supplementary pamphlet of notes, is a 150-page bound book published for the convenience of its customers by John A. Roebling's Sons Co. of Trenton, N. J. The material is mostly tabular with explanatory text, including weights and measures, conversion factors, areas of circles, wire gauges, copper, iron, stranded aluminum and insulated wire.

The General Electric Company has prepared and is distributing a loose leaf binder containing five of their latest bulletins on Wires and Cables, as follows: Bulletin No. 49300, Armored Cables; Bulletin No. 49302, Wires and Cables—General; Bulletin No. 49301—Varnished Cambric and Paper—Insulated Cables; Bulletin No. 49304—Conductors Insulated with Vulcanized Rubber Compound; Bulletin No. 49303—Splicing Materials and Junction Boxes. Every user and purchaser of wires and cables should have a copy of this handy guide, as it contains valuable information regarding every phase of this particular branch of the electrical industry.

Miscellaneous Bulletins

Longmans, Green and Co., Publishers, have published a bulletin listing their recent publications.

A tabulation of mine accidents and a listing of explosives, lamps and motors permitted to be used in mines is included in a recent bulletin issued by the Bureau of Mines.

"When All the West was Wireless" is the title of a booklet honoring Col. W. F. Cody (Buffalo Bill) and proposing a monument in tribute to America's Pioneers.

D. Van Nostrand Company have recently gotten out a new catalogue of scientific literature on technical, industrial and engineering subjects.

The Rand McNally & Company of New York City have published indexed pocket maps of Oregon, California and Washington which may be purchased at the Technical Book Shop in San Francisco for 25 cents. The location of railroads and electric lines, counties, congressional townships, cities, towns, villages, post offices, lakes, rivers, etc., is included.

IMPROVED VENTILATED COMMUTATING POLE RAILWAY MOTOR

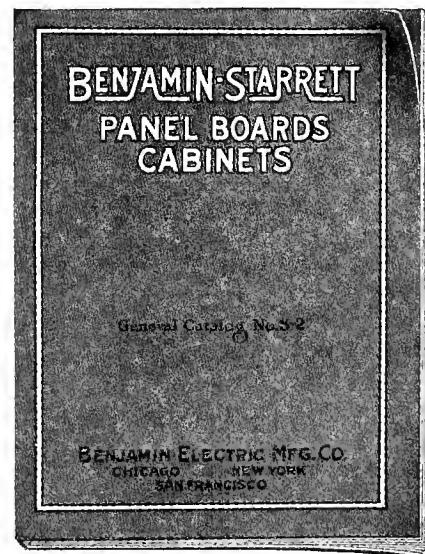
The General Electric Company has just issued bulletin No. 44417-A, describing in detail the GE-258 Ventilated Commutating Pole Railway Motor which has been developed to help solve the problem of electric railways in rapid and economical city transportation by the use of light weight cars.

In general details of design and construction set forth in Bulletin No. 44417A of the General Electric Company, the GE-258 Motor follows G-E railway motor practice, incorporating the special features and manufacturing processes of standard ventilated motors while light weight, compactness, and rigidity are obtained to a considerable degree by the use of ball bearings for the armature shaft. It also possesses to the fullest extent the characteristics of reliability and low cost of maintenance inherent in General Electric railway motors.

SPEED-REGULATING PANELS WITH AUTOMATIC PRESSURE REGULATOR

An Automatic Pressure Regulator described in Bulletin No. 48319-A of the General Electric Company provides the most convenient means of controlling the speed of a motor operating an equipment where changes in air or liquid pressure will automatically vary the speed, in order to maintain the pressure within certain limits. If the regulator is adjusted, the motor is automatically retarded or speeded up until the pressure is again constant.

Benjamin-Starrett Panel Boards and Cabinets are the subject of General Catalog No. S-2 from Benjamin Electric Manufacturing Company. These are so standardized that the single units can be assembled to care for any job from a



New Catalog for Panel Cabinets

small residence to a large industrial plant. In the words of the manufacturer "they comply with all the conditions making for safety, economy, convenience, appearance and permanency of installation."

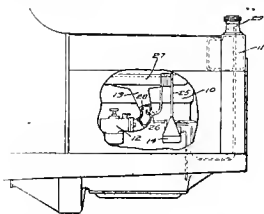
WHAT WESTERN INVENTORS ARE DOING

The growing uses of the electric water heater as a supplement to the electric range is bringing this problem to the forefront in the electrical world. The West with its abundant water power is particularly interested in finding a means to answer this need and below is a suggestion for such a heater. Descriptions of a water vaporizer for internal-combustion engines, an automatic water feed device for oil burners, a gas and shrapnel land-mine and an electric circuit-closer for automobiles follow.—The Editor.)

1,239,380. Water-Vaporizer for Internal-Combustion Engines.

William H. Fox, Hollywood, Cal.

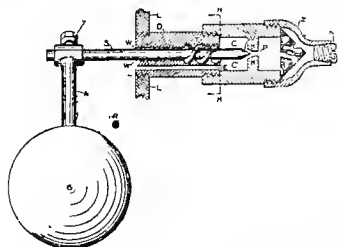
A vaporizer, comprising a water reservoir, a vaporizing chamber mounted in connection therewith, means whereby said chamber will connect with the intake manifold of an internal combustion engine, means whereby the suction of



the engine will act to create a vapor within said vaporizing chamber and draw it into the intake manifold in combination with a gaseous fuel passing therethrough, means whereby water and vapor may be delivered to said reservoir from the radiator of said engine, and means whereby the aqueous vapor drawn from the vaporizing chamber to the intake manifold will be heated as it is delivered thereto.

1,239,267. Automatic Water-Feed Device for Steam-Generators, Oil-Burners, etc. Joseph L. Groves, Los Angeles, Cal.

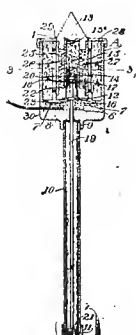
A valve of the type described consisting of a body having helical grooves in the wall of the valve-stem opening



and a channel parallel to the valve-stem opening, a valve seat spaced from the valve-stem opening within the body, and a stem turnably mounted in the valve-stem opening engaging with the valve seat.

1,239,134. Gas and Shrapnel Land-Mine. John R. Steel, San Francisco, Cal.

A gas and shrapnel land mine, comprising a container



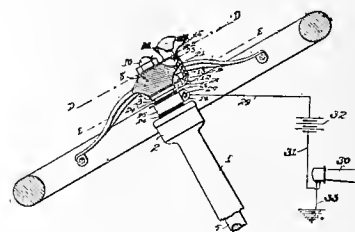
having an annular and a central chamber formed therein, together with communicating ports, said central chamber adapted to receive a shrapnel bomb and an explosive charge

for its expulsion and said annular chamber adapted to receive a substance which, when ignited, generates and liberates a gas, means for igniting the explosive charge to expel the bomb and to ignite the substance contained in the annular chamber, and means for exploding the bomb after expulsion and at a predetermined elevation.

1,239,236. Electric-Circuit Closer for Automobiles. George

F. Voight, San Francisco, Cal.

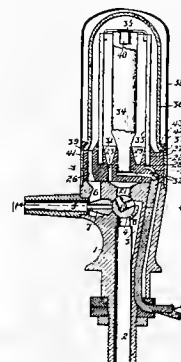
The combination with the steering mechanism of an automobile comprising a steering wheel fixedly mounted on the upper end of a steering wheel shaft journaled in a hollow



stationary standard, of a circuit closer comprising a stationary contact element forming a switch terminal for an electric circuit which element is insulatingly mounted on the standard adjacent its upper end, a movable contact element forming the other switch terminal of said electric circuit which movable contact element is movably supported by the steering wheel shaft and provided with a section extending above the steering wheel adapted for engagement by the hand of the operator and provided with a second section extending below the steering wheel and in close relation to the stationary contact element and adapted to engage therewith for closing the circuit, and resilient means supported by said steering wheel and in engagement with said movable contact element for normally holding the latter element out of electrical contact with said stationary contact element.

1,239,325. Electric Water-Heater. Ernest C. Webster, Oakland, Cal.

In an electric water heater, the combination of a block of insulating material, a central metallic conductor and a tubular metallic conductor, around which said block is



molded, a central electrode, a tubular electrode around said central electrode, said electrodes being secured respectively to said conductors, and a casing around said electrodes, said electrodes being supported only at their lower ends, their upper ends being free.

NEW ELECTRICAL DEVELOPMENTS

(Typical of new electrical development for the past semi-monthly period are the many bids for motor and pumping installations that are being called for by various municipalities of the West. The equipment in motors and pumps asked for by the city of Portland as noted below is an instance of this activity. Other notations on new electrical development throughout the West may also be gleaned from the following lines.—The Editor.)

FINANCIAL

PORTLAND, ORE.—An increase of 14 per cent on the net earnings of the Pacific Power & Light Company in August over the earnings for the same month of 1916, was reported in the monthly statement from the treasurer.

NORTH MADRAS, ORE.—The directors of the North Unit Irrigation Association voted to hold an election October 29 to determine if the people in the proposed district are in favor of issuing bonds. The issue will be for \$5,000,000.

PHOENIX, ARIZ.—The Arizona Corporation Commission authorized the Phoenix Gas & Electric Co. to issue \$550,000 bonds, \$185,000 of which are to be debentures, the proceeds to be used for extensions and general improvements.

SAN FRANCISCO, CAL.—A statement of the condition of Municipal Railway reserve fund, issued by the Board of Public Works, shows the amount in the fund to be \$1,149,816.89. This sum consists of investments in City Library bonds, with interest, \$547,643.45, and cash, \$601,673.44.

SAN FRANCISCO, CAL.—The preferred and common shares of the San Joaquin Light & Power Corporation were called in the listed department of the San Francisco Stock and Bond Exchange for the first time recently. The preferred was quoted at 75 bid and the common at 5 bid, 9 asked, but no sales were recorded.

SAN DIEGO, CAL.—The San Diego Consolidated Gas & Electric Company has applied to the State Railroad Commission for permission to issue \$1,000,000 in bonds. The company announces an expenditure of \$687,000 this year, of which \$284,000 will be used for the extension of its electric transmission lines to San Juan Capistrano to connect with the hydroelectric power line of the Southern California Edison Company of Los Angeles.

SAN FRANCISCO, CAL.—The State Supreme Court, in a recent decision, upheld the judgment of the lower court against the Pacific Gas & Electric Co. and the Coast Counties Light & Power Co. in suits to recover taxes paid to the State and alleged to be excessive. The Pacific Gas & Electric Co. sued to recover \$41,000 and the other corporation sought to recover \$1693. E. D. Roberts, former state treasurer, was made defendant in the actions.

FRESNO, CAL.—Earnings, statement twelve months ended May 31, 1917, shows that the San Joaquin Light & Power Co. earned its interest charges 2.19 times during the period. Net income from operations, plus miscellaneous revenue, amounted to \$1,091,927, and interest charges were \$493,202, leaving a balance before depreciation of \$598,725. Depreciation charge is eliminated from this statement. Total interest charges for the previous 12 months were \$482,498, showing an increase for the 1916-17 period of \$10,703.

SAN FRANCISCO, CAL.—Report of gross and net earnings for the Western States Gas & Electric Company for the month of August shows marked advance over earnings for the corresponding month of 1916. The figures in detail follow, together with report of earnings for the year ended August 31, 1917, and 1916: Gross earnings: August, 1917, \$116,849; 1916, \$97,515; increase, \$19,334; per cent increase, 19.8. Net earnings: August, 1917, \$55,428; 1916, \$47,084; increase, \$8,343; per cent increase, 17.7. Year ended August 31: Gross earnings, 1917, \$1,340,331; 1916, \$1,218,887; increase, \$121,443; per cent increase, 9.9. Net earnings: 1917, \$630,712; 1916, \$581,353; increase, \$49,358; per cent increase, 8.5.

INCORPORATIONS

SEATTLE, WASH.—The Johnson Power Transmission Company has been incorporated here.

LEWISTON, IDAHO.—The Smith Manufacturing & Irrigation Company here has been incorporated.

PORTLAND, ORE.—The Stubbs Electric Company has been incorporated with a capital stock of \$50,000.

LOS ANGELES, CAL.—The Renard-Story Electric Company of this city has been incorporated at \$25,000.

KAHLOTUS, WASH.—Articles of incorporation have been filed by the Kahlotus and Page Telephone Company.

TRANSMISSION

COEUR D'ALENE, IDA.—The Washington Water Power Company is to construct a power line into the Coeur d'Alenes to cost \$200,000, same to be started early in the spring.

TROY, MONT.—Kootenai Light & Power Company has signed a contract to furnish all the electric power necessary to maintain and operate a light, heat and power plant here.

SAN DIEGO, CAL.—San Diego Consolidated Gas & Electric Company has been authorized to serve the towns of Escondido, Fallbrook, and Oceanside in San Diego county.

SAN FRANCISCO, CAL.—Board of Public Works has called for bids for installing electrical yard work in connection with the northeasterly wing of the San Francisco Hospital.

HAILEY, IDA.—A light and power plant is to be installed next year at the mines of the Mascot and Terra Mining Company, according to Charles Peter, president of the companies.

BARSTOW, CAL.—Work will begin at once by the Southern Sierras Power Company on the erection of a new electric transmission line west from Barstow, a distance of 41 miles, at a cost of about \$115,000.

The program outlined by Jackson included also the remodeling of the nine mile flume at Sand Bar, just above the Stanislaus plant. This will cost the company \$1,500,000, but will double the capacity of the power plant.

BAKER, ORE.—A 66,000 volt transmission line is to be constructed from Robinette to Halfway, a distance of 12 miles, for delivering 200 h.p. to the Corucopia miles. A sub-station will be erected at Halfway, cost about \$30,000.

AMERICAN FALLS, IDA.—Idaho Power Company has awarded contract for construction of a new 5000-horsepower station and closing of breach in dam to Sam Porter at \$50,000. The new unit will practically double power now being generated.

VANCOUVER, WASH.—The Interstate Bridge Commission has authorized the installation of an electric generating system to be installed on the Columbia River inter-state bridge, to cost about \$7,000. Contract for equipment has been awarded to the General Electric Company at \$5,200.

QUINCY, CAL.—According to Lloyd P. Cornell, field manager of the Great Western Power Company, that corporation has decided to build a transmission line from Veramont station near Taylorsville to the Walker copper mine, via Genesee mine, Genesee valley, a distance of sixteen miles.

SEATTLE, WASH.—The Board of Public Works has approved the recommendation to award the contract for furnishing meters for the ensuing year as follows: To the W. R. Hendry Company, \$10,000 worth; the Northwestern

Supply Company, \$10,000, and the Fobes Supply Company, \$7,500.

SAN FRANCISCO, CAL.—Arrangements have been completed whereby the Eureka division of the Western States Gas & Electric Company will secure 1000 kilowatts of hydroelectric energy from the Northern California Power Company. This enables the Western States Company to shut down a steam generating plant.

LOS ANGELES, CAL.—Announcement has been made of an addition to the hydroelectric development of the Southern California Edison Co. at Big Creek. This additional hydroelectric work calls for an expenditure of more than \$2,000,000, and the increasing of the production of energy by 12,500 h.p., immediately.

SEATTLE, WASH.—While the plan of the city of Seattle to purchase a completed hydro-electric plant has not been abandoned, bids were not opened October 5 as called for and no date of opening has been fixed. Plans for the plant were approved nearly a year ago and a utility bond issue of \$3,000,000 was authorized for the purpose.

SAN BERNARDINO, CAL.—The erection of 39 miles of transmission line from Victorville to Barstow is under consideration by the Southern Sierras Power Company. The proposed line, it is understood, will be extended to Daggett and other sections in the vicinity of Barstow. The contract for construction of line has been granted to F. L. Somers.

COLUMBUS, MONT.—Preliminary work has been started by the Montana Power Company on its new power site on the West Rosebud River. A site for the proposed dam will be surveyed across the mouth of Mystic Lake, and a survey will also be run for a tunnel, which will tap the bottom of the lake a quarter of a mile from the foot of the falls.

SAN FRANCISCO, CAL.—Preparations are being made by the Western Power Company to enlarge its right of way from its power plant in Big Meadows to the Bay region. The company, it is understood, will as soon as rights of way have been secured, erect another high-tension transmission line, paralleling its present lines from its generating plant to San Francisco.

EVERETT, WASH.—At a special cost of \$25,000, less the amount spent in developing the property, a thirty months priority right on the water power on the Sauk-Suiattle river in the Washington forest has been granted the American Nitrogen Products Company, Securities building, Seattle. The first unit of the plant is proposed for Darrington and when the three units are completed will cost about \$6,500,000, according to report.

FRESNO, CAL.—Work is progressing on the half-million-dollar generating plant of the Pacific Gas and Electric Company that is now being erected on the West Side branch of the Southern Pacific at the north end of the railroad reservation. The machine shop has been completed and concrete is now being poured for the main building. The entire investment will represent an expenditure of at least half a million dollars.

SEATTLE, WASH.—J. J. Agutter & Company, electrical engineers and contractors of Seattle, Wash., have closed a contract for the complete electrification of St. Joseph's hospital at Deer Lodge, Montana, at about \$3500. They have about closed up the work in connection with the Frederick & Nelson store building in Seattle. This was one of the largest contracts placed in the northwest for some time, running above \$50,000 all told.

CHICO, CAL.—The new concrete dam of the Pacific Gas & Electric Company across Butte Creek, twelve miles above DeSabra, is practically finished. I. B. Adams, who is in charge of the DeSabra district, announced. The dam is 70 feet high and about 150 feet long. It supplants an old log and rock dam which diverted water for the DeSabra and Centerville power houses, and is a part of the program of additions to and betterment of the DeSabra district's system.

SAN DIEGO, CAL.—Board of Supervisors have awarded to the San Diego Consolidated Gas & Electric Company a franchise for the installation of electric power service throughout the county. The award was granted on a bid of that company of \$100 for privilege in response to advertisement for bids. The term of the franchise is 50 years, and San Diego county will receive 2% of the gross receipts of the company, beginning five years after contract is entered into.

KLAMATH FALLS, ORE.—The big concrete dam being constructed by the California-Oregon Power Company, just over the Oregon line on the Klamath River at Copco, in California, is now nearing completion. Power machinery is now being set in place in the power house and when fully installed will provide about 50,000 horsepower, which is one-half of the amount ultimately to be manufactured in the two power houses at this place. About thirty days will be required for this concrete to set before the water is turned into the reservoir and it is estimated that it will take the Klamath River about seven weeks to fill up the big reservoir above the dam.

STOCKTON, CAL.—Western States Gas & Electric Company of Stockton has filed an application with the State Water Commission asking permission to appropriate 5000 acre-feet from Medley Lake and 7000 acre-feet from Echo Lake, both in El Dorado County, and 8000 acre-feet from Twin Lakes in Alpine County, for the purpose of developing 2500 horsepower at the existing hydro-electric plant of the American River Electric Company for a period of seven months in the year. There is a proposed main ditch 7.3 miles long and at Medley Lake there is a series of three small dams for raising the water level. At Echo Lake it is proposed to drive a tunnel to draw the level of the lake 40 feet below the natural outlet, said tunnel to be 5x6½ feet in cross-section and 2600 feet long. The total fall to be utilized is 610 feet from dam to water-wheel nozzle, the water to be returned to the south fork of the American River after use.

PORTLAND, ORE.—Bids will be received at the office of the city purchasing agent up to October 29, 1917, at 2 p.m., for furnishing the city one water pumping machine, capacity 1,000,000 gallons of water per twenty-four hours with a discharge pressure of 281 pounds per square inch and a suction pressure of 25 to 28 pounds per square inch. Bid must be accompanied by a certified check payable to the order of the city for ten per cent of bid. Bids will be received at the same time and place for two multi-stage turbine pumps, 1,000,000 gallons capacity, head 281 pounds; two 100 h.p., 2200 volt three-phase, 60 cycle slip ring motors; one multi-stage centrifugal or turbine pump, 500,000 gallons capacity, head 105 pounds; one 40 h.p. three-phase, 60 cycle, 220 volt slip ring motor; one multi-stage centrifugal or turbine pump, 500,000 gallons capacity, head 257 pounds; one 75 h.p., three-phase, 60 cycle, 200 volt slip ring motor. Certified check payable to the order of the city of Portland for ten per cent of bid required.

SAN FRANCISCO, CAL.—The Sierra and San Francisco Power Company is preparing to spend more than \$5,000,000 in the construction of reservoirs in the mountains above Oakdale, and in the enlargement of existing ditches and storage dams, according to the statement made before a joint meeting of the Oakdale and South San Joaquin District Boards by H. F. Jackson, general manager of the public utility corporation. These improvements, outlined by Manager Jackson, consist of the enlargement of the Philadelphia ditch, to permit of a greater flow of water for development of power, the construction of the upper Strawberry dam, which will cost \$3,225,000, and will take three years. This dam will impound 55,000 acre-feet of water. Then the Donnel's Flat reservoir, to impound 80,000 acre-feet, will be built, estimates for which have not been completed. The program outlined by Jackson included also the remodeling of the nine mile flume at Sand Bar, just above the Stanislaus plant. This will cost the com-

pany \$1,500,000, but will double the capacity of the power plant.

TRANSPORTATION

PORTLAND, ORE.—The Portland & Oregon City Railway Company contemplates extending its railway from Baker Bridge to Viola.

SEATTLE, WASH.—H. H. Travers, Arcade Building, was awarded contract for making extension to Division A of the Municipal street railway at \$19,544.

SOUTH PASADENA, CAL.—D. W. Lontius, traffic manager of the Pacific Electric Co., has agreed to immediately start the construction of an electric line to Yucaipa valley.

SAN FRANCISCO, CAL.—Oakland, Antioch and Eastern (electric) Railway Company has been authorized to issue \$435,853 in short term notes to banks in San Francisco and Sacramento.

SEATTLE, WASH.—Contract for eight one-man passenger cars for the Seattle municipal railway has been awarded to Burton R. Stare of the Northwestern Supply Company, local, at \$3,750 each.

SANTA ANA, CAL.—The board of trustees granted to the Pacific Electric Railway Company a franchise to construct, maintain and operate for a term of 50 years an electric railroad across the Irvine Extension.

SAN FRANCISCO, CAL.—Without an opposing voice the Board of Supervisors unanimously adopted the resolution declaring for the acquisition of the United Railroads and instructing City Engineer O'Shaughnessy to begin at once the work of valuing the physical properties.

LOVELOCKS, NEV.—The Commissioners of Storey County have granted the Nevada Valleys Power Company a franchise to erect an electric transmission line over the roads and highways of the county. The company proposes to build an electric power plant in Storey County near the McCarren Ranch on the Truckee River, from which it will distribute electricity in the entire western portion of the State of Nevada, and may possibly extend its service to other adjacent fields.

SEATTLE, WASH.—City council has passed a bill accepting a plan for extension of the city car lines by connecting up the Lake Burien line and Division "A." The plan calls for the expenditure of \$350,000 in constructing an elevated road on Washington street, Railroad avenue, Whatcom avenue and Spokane street, and extending from First avenue South to the West Waterway. Expense of construction is to be met by the sale of utility bonds, the interest and principal to be taken from the revenues of the street car system.

GRAND JUNCTION, COL.—The construction of an electric railway from Grand Junction up into the Uintah Basin via Mack, Col., Ouray, Duchesne and Myton to Helper or Colton, via Indian Canyon or the Strawberry Valley, to connect the lines of the Colorado Midland Railroad and the Utah Coal Route, which will take over the railroad of the Denver & Rio Grande between Helper and Provo, is under consideration. C. M. McNeill, vice-president of the Colorado Midland Railroad Company, Colorado Springs, may give further information.

SEATTLE, WASH.—Corporation counsel of Seattle in an opinion given Councilman Will H. Hanna, chairman of the finance committee of the city council, holds that transfer of funds from the city light depreciation fund for the purpose of extending the city car line from 13th avenue West and Thorndike avenue across the Ballard bridge to Leary avenue and Market street is illegal. This is held on the ground that the street railway fund is insolvent. Councilman Erickson, who is fathering the street railway extension of the city car line into Ballard, then asked for an appropriation from the general fund of Seattle in the sum of \$12,000. Corporation counsel holds in this case that before money can be taken from the general fund to build an extension to the city railway system, it is

necessary to submit the plan for such extension to the people for their adoption or rejection. Some time ago contract for construction of the Ballard extension was awarded to R. H. Travers at \$19,554.43. In view of the uncertainty as to the funds for construction, contractor asked to be released and request was granted.

ILLUMINATION

THATCHER, ARIZ.—The city of Thatcher is considering the establishment of an electric light plant.

TROY, MONT.—Council has granted franchise to William B. McDonald to install an electric lighting plant.

LOS ANGELES, CAL.—Sealed bids are being received by the Board of Supervisors for installing a street lighting system in the Walnut Park Lighting District.

SAN FRANCISCO, CAL.—The Bureau of Architecture estimates that the completion of the lighting system for the San Francisco Civic Center will cost approximately \$30,000.

BLACKFOOT, IDAHO.—The city council has entered into a new contract with the Idaho Power Company for new street-lighting service, which will greatly increase the street illumination.

SEATTLE, WASH.—The city council, after reconsidering previous action, has passed resolution 5731 accepting the bid of John E. Price & Co. for the \$390,000 light and power bonds.

CANYON CITY, ORE.—The lessees of the electric plant at John Day, is reported, are planning the installation of an electric lighting system in Canyon City. The town is now lighted with gasoline lamps.

OAKLAND, CAL.—Civic organizations of the east bay cities are preparing data for a concerted fight against the application of the Pacific Gas & Electric Company's request for an increase in gas rates. The Company asks an increase from 90 cents to \$1.00.

SEATTLE, WASH.—The city council has voted to reject the bid on the proposed \$350,000 water department bond issue but to sell the \$390,000 light department issue. It was also voted to award the \$390,000 issue to the Dexter-Horton Trust & Savings Bank, on a basis of 5 per cent interest at the rate of 92.54.

POCATELLO, IDAHO.—The city council has recently entered into a new street-lighting contract with the Idaho Power Company for a period of ten years. The new contract provides for a complete new street-lighting system, including 355 curb standards and 161 incandescent lamps in the viaduct and subway.

LA JUNTA, COLO.—Arkansas Valley Railway, Light & Power Company has been granted a renewal franchise by La Junta for electric light and power. This action ends an agitation for a municipally-owned electric lighting plant, which resulted two and one-half years ago in a popular vote for a bond issue for this purpose. The bond issue carried by the narrow margin of 11 votes. Subsequently the Public Utilities Commission of Colorado investigated the company's rate charges in La Junta and made certain reductions in the schedule. The rates as then revised will remain in effect under the new franchise.

TELEPHONE AND TELEGRAPH

GREAT FALLS, MONT.—The Milwaukee Telephone & Telegraph Company contemplates installing a duplex system on all its lines.

TROPICO, CAL.—The Pacific Telephone and Telegraph Company has let a contract for the erection of a building here to cost \$46,000.

ALBUQUERQUE, N. M.—The Mountain States Telephone and Telegraph Company has finished work in this immediate section and is now working at Tularosa. After that work is completed an additional line of wire will be strung from La Luz to Mountain Park. A new line will also be put on between Alamogordo and El Paso.

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These fifteen prizes will be awarded to those subscribers getting the greatest number of subscriptions for the **Journal of Electricity** between the 1st of November, 1917 and the 1st of February, 1918.

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President California Association Electrical Contractors and Dealers

ALBERT H. ELLIOT

Secretary Pacific Coast Electrical Supply Jobbers' Association

will certify as to the winners in accordance with the rules printed on the following page. In the event of a tie in the number of points for any prize the award will be made to the contestant having secured the greatest number of *new* subscribers.

You can do your bit toward developing the electrical industry by boosting the **Journal of Electricity**, which has been boosting the electrical business for thirty years. The **Journal** keeps its readers abreast of the times and is the logical medium for the interchange of ideas electrical, particularly in the West.

Why not get into the contest yourself and pass the word along? The list of entries and each man's standing will be published in the JOURNAL during the period of the contest.

Co-operation is the watchword of the electrical industry today. Let's get together in real earnest

JOURNAL OF ELECTRICITY

VOL. XXXIX NO. 9

SAN FRANCISCO, NOVEMBER 1, 1917

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Faries Manufacturing Company
Decatur, Illinois

JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate Editor

VOLUME XXXIX

SAN FRANCISCO, NOVEMBER 1, 1917

NUMBER 9

Contents

CONSTRUCTION OF A UNIQUE POWER PLANT.....	392
A Power House chiseled out of solid granite containing a hydroelectric unit operating under a variable head, thus constituting a new and unique record in installation.	
THE INCOME TAX AND YOUR INCOME—by Charles P. Cutten.....	395
What you and your business are going to have to pay under the 1917 Income Tax which goes into effect on November 1st.	
THE HOME ELECTRICAL—by Clotilde Grunsky.....	408
An example of how convenient wiring combines with the latest in electrical devices to give real comfort—a hint to the contractor-dealer.	
SELLING BY NIGHT—by Frank D. Fagan.....	410
The illuminating factor in the show window, how the merchant can be brought to utilize modern methods of lighting by teaching him what best meets his needs.	
CO-OPERATION IN THE ELECTRICAL INDUSTRY—by O. B. Coldwell.....	413
The contractor-dealer and the central station can work together in educating the consumer, dealing with the architect, in wiring campaigns and joint advertising.	
DANGER OF UNDERRATING THE OVERHEAD—by A. H. Halloran.....	415
To know what you are making you must know what you are spending. A tabulation of what should be reckoned in as overhead expense and of how it should be applied.	
NOTES ON THE LAW OF PATENTS—by Wm. K. White and H. G. Prost.....	422
The basis of patent law, what is patentable and the rights of the inventor, together with a description of some of the most interesting of the patents from the West.	
EDITORIALS	389
An Appeal to Men of the Industry—Armed Protection for Power Plants—Accident Prevention—The Power Situation in the West—A New Field for the Contractor-Dealer—The Portability of the Electric Motor—An Interesting Problem in Dam Design.	
How the West is Helping to Win the War—I.....	388
(Frontispiece)	
Better Office Methods—by H. H. Wade.....	397
Electricity on the Farm.....	398
Short Journeys in Pacific Lands.....	399
Women in the Industry.....	401
Current Rate Fixing Problems—by C. E. Grunsky	403
The Deterioration of Western Coal in Storage...	404
Burner Classification in Fuel Oil Practice—by Robt. Sibley and Chas. H. Delany.....	405
Wiring Features of the Portland Auditorium—by F. D. Weber.....	412
Suggestions for the Contractor and Dealer—by George A. Schneider.....	417
Electricity at the Utah State Fair—by C. W. Kendall.....	419
Constitution of the Utah Society of Electrical Contractors and Dealers.....	420
Letters to the Editor on Carbides and Industrial Accidents.....	421
Sparks—Current Fact, Figures and Fancy.....	424
Personals.....	425
Meeting Notices for Electrical Men.....	427
Builders of the West, XVI—Joseph N. Le Conte	427
Happenings in the Industry.....	429
Good Books and Bulletins for Electrical Men....	431
A Successful Use of the Daylight Lamp.....	431
New Electrical Developments.....	432

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Index to Advertisers—page 12, Where to Buy It in the West—page 13.

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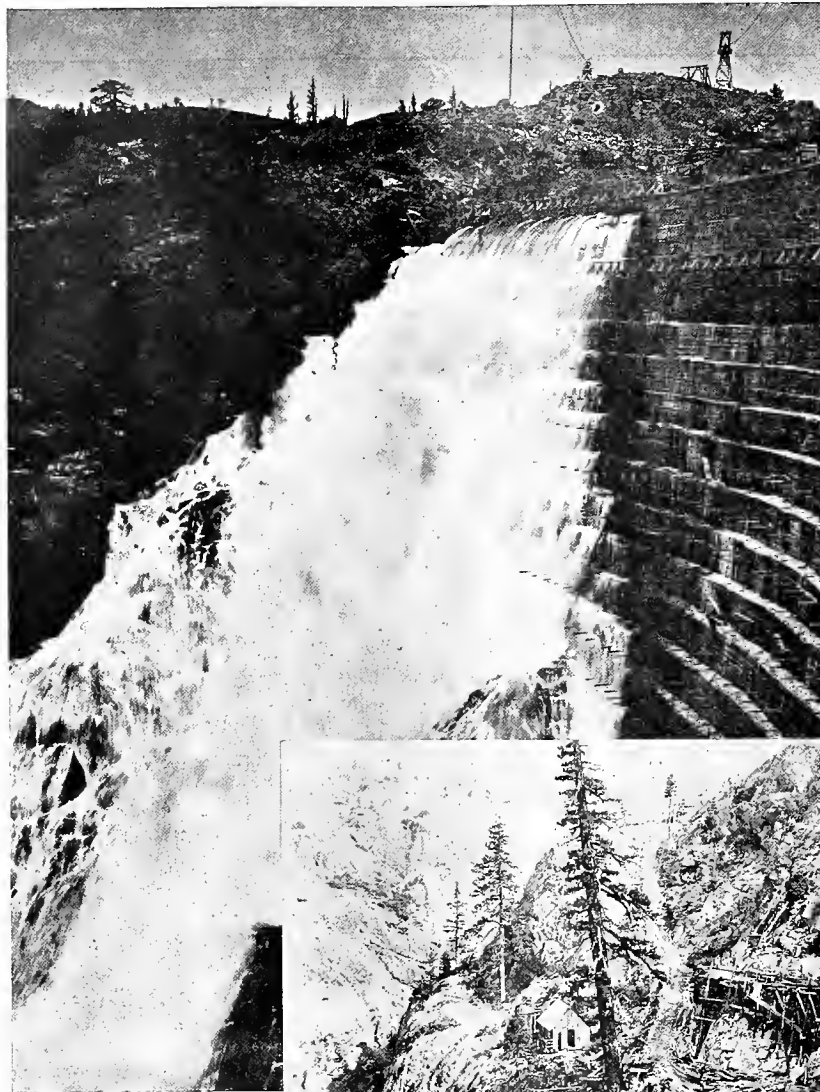
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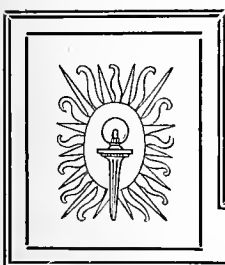
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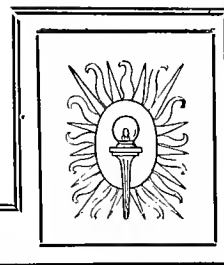


THE GIANT SPAULDING DAM AND ITS NEW POWER DEVELOPMENT

Immediately below the great Spaulding Dam of the Pacific Gas and Electric Company is being erected in an enclosure, hewn from solid granite, a unique power plant that will recover the power of the stored waters latent in the variable head of water supply in this mammoth reservoir. This unique instance of constructive genius of this well-known company—the greatest of hydroelectric institutions in the world—is typical of that splendid spirit of patriotic fervor that pervades the leaders and the rank and file of the electrical industry. In thus supplying gigantic energies for the turning of the wheels of industry, now loaded to the breaking point throughout the West, a decidedly helpful factor is added to the nation's ability to win the war.



JOURNAL OF ELECTRICITY



Devoted to the Generation, Distribution and Utilization of Energy

VOLUME XXXIX

SAN FRANCISCO, NOVEMBER 1, 1917

NUMBER 9

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THE CALL TO SERVICE

There are two courses open to a man—to die for his country or so to live for it that his country will be worth dying for. And either task calls for an ideal of service steadfastly held in view above all selfish interests.

From the president of a great university in the West who a few months back wrote, "I am very much honored and pleased to be given the place of honor by the Journal of Electricity" to the beautiful resolutions recently unanimously passed by a great gathering of men of the industry "expressing appreciation and gratitude to the publication known as the Journal of Electricity for its very excellent co-operation and interest manifested," there continue to come into the editorial and managerial departments of the Journal of Electricity verbal and written expressions of whole hearted commendation for its work. With the idea of steady improvement in mind, the Journal is constantly endeavoring to meet new problems as they arise. With this issue several changes have been initiated. There will be further changes in the future that these pages may continue to meet the needs of the contractor-dealer, of the jobber, the central station and the engineer. The one excuse for journalism is the service which it may perform. In the encouragement of all that is progressive, with the idea of better business in mind but above that, a better nation and a better co-operation between nations, the Journal has given its service as best it saw it for the upbuilding of the electrical industry in the West. It hopes to make that service greater. Elsewhere in these pages announcement is made concerning a subscription campaign that offers a beautiful automobile, a handsome grafonola and numerous cash prizes to those that will assist in this great work throughout the West.

Men of the electrical industry—the Journal of Electricity has proven its worth by thirty years of active service. In the prime of its splendid manhood, it now reaches forward to take its place in affairs elec-

trical in the councils of the nation. Your whole-souled co-operation is most earnestly solicited.

One of the surprising incidents of America's entrance into the present world war is the rapidity with which governmental authorities saw to it that the great hydroelectric plants of the West were amply protected by armed guards under military control.

Recent withdrawal of these governmental troops and the substitution of civilian guards has, however, caused considerable anxiety and much adverse criticism on the part of those having the industrial power supply responsibilities at heart in the great West.

A glaring example of the inadvisability of this move is to be found in the region that supplies electric power for the operation of mines in the great Coeur d'Alene district of the Northwest.

The Washington Water Power Company furnishes the power for the major portion of this district which produces over one-third of the entire lead output of the United States and a very large proportion of the zinc, two metals widely used in munition manufacture. As a consequence, in the uninterrupted operation of these mines, the Government has a vital interest.

It is interesting to note the action which the Canadian Government has consistently taken since the beginning of the war in 1914 in regard to the protection of its hydroelectric plants. For instance at the plant of the West Kootenai Light and Power Company at Bonnington Falls, just across the border to the north of Spokane, the Canadians have an armed force of forty-two soldiers guarding the one power plant at that place, which furnishes power for a num-

An Appeal to Men of the Electrical Industry

Armed Protection for Power Plants

ber of copper mines and also for the smelter at Trail.

Immediately to the south of this Canadian installation, the great Washington Water Power Company furnishes power for the large lead and zinc mines of the Coeur d'Alenes, including the Bunker Hill and Sullivan smelter at Kellogg, Idaho, and yet with this nation's tremendous resources the government seemingly does not take the same precautions as do our Canadian allies to the north with their much more limited means.

It is realized that a gigantic task now confronts those having the protection of the nation's industries in charge and as a consequence this editorial is offered only in the spirit of constructive criticism and it is believed that a careful review of the matters herein called to the attention of these governmental authorities will receive immediate and thoughtful attention.

In the issue of the Journal of Electricity for October 1, 1917, attention was called to the overdoing of accident prevention in the West.

Accident Prevention

On another page of this issue appears a very able communication from the electrical engineer of the California Industrial Accident Commission defending the work of that commission.

The Journal of Electricity would feel remiss in its duty did it pass by this discussion without calling the attention of its readers to the very excellent work that has been done and is being done by this group of public spirited men. Their work merits the support of all upbuilders of the electrical industry throughout the West.

The fact remains however that general rules are often found burdensome in special application. A forceful illustration of this is to be found in the published rules for overhead crossings by the U. S. Bureau of Standards. In the West, due to the sparsely settled condition of the country and due to the unique engineering problems encountered there, these rules have proven wholly inapplicable. As a consequence the Pacific Coast Section of the National Electric Association has undertaken to advise with the California Railroad Commission on drawing up rules that are particularly adaptable to the conditions that prevail here.

And so it is in all cases of accident prevention that only by the most careful consideration of special conditions involved, with a due weighing of the financial demands, can an industry hope to be of maximum use to the public it serves and at the same time render its service at reasonable rates.

The strain of the nation's industrial activity is in a large measure being borne today by the power companies throughout the length and breadth of the land.

The Power Situation in the West

In the West this call for increased power demands has created a situation hitherto unknown in the commercial and engineering development of this section so prolific in possibilities for vast water power generation.

So acute has the demand for power become that the problem of how additional electric energy may be supplied is now the most serious one before central station managers of the West.

This state of affairs is practically the same in all districts of the West with the possible exception of eastern Washington and even in this latter district, the paying of the current month's power supply to the Washington Water Power Company for the new extension of the Milwaukee Railroad electrification means that this district, too, will soon be no exception to the power situation elsewhere to be found.

In these districts where power shortage has become extremely acute, the demand for still more power can be met to a limited extent by additional calls upon the steam auxiliary plants connecting with the various systems. But this power is of course expensive due to the present high prices of oil and other fuels. And even this power is limited to the present installed capacity of such plants.

As for hydroelectric extensions the great advance in cost of materials makes the initial installations of today almost double that of a season back. Then, too, deliveries are so slow as to make an immediate installation of large proportions practically an impossibility. Again, the difficulty of securing further moneys for private investments of this nature is noticeable on all sides due to the heavy financial demands of the government and the present low prices of stocks and bonds or even utilities of the very highest grade. The diverting of such private funds as might otherwise be available into munitions and other projects of immediate high return value is also having its effect.

Hence a rather anomalous state of affairs exists today in the West. Never before in its history have its hydroelectric utilities been more widely brought into activity and yet due to the exigencies of world stress, the actual net returns for power sales are below normal.

Hence when considering the advisability of granting increases in power rates either for new industrial activities or for old customers, the public should be cautious in passing adverse comment before data on all the very unusual factors affecting rates can be properly brought out in public hearings.

Almost every one employs some one in his business. Almost every one is sure that the person whom

he employs might have been better fitted to meet his needs when he first employed him—he figures up the cost of the 'breaking in' process

and reluctantly adds it to the necessary expenses of his business. With large concerns this loss is not a trifling matter, but mounts up into thousands of dollars annually—and yet business men generally, except as they are taxpayers or fathers, are inclined to take but little interest in our school systems. The public school is trying to do the same thing to the child that the employer is—to make a good citizen and a good employee out of him—but the school has the first and the longer chance. That it does not achieve better results, that the employer must still do so much by way of education, is largely the employer's fault, for he has not made of the public school system what he might.

And right here is the new opportunity of the electrical contractor and dealer. The children of the

schools need the new ideas that are being evolved in the electrical industry. They should see new appliances, and hear of the new uses of electrical application. They should have that mental stimulus that comes from writing and talking of the thing that today is regenerating and liberating the home—the method electrical. W. R. Putnam, a well known sales-manager of one of the largest power companies of the West, recently brought out this necessity of appealing to the kiddies as a means for upbuilding the electrical industry. At the same time its wholesome effect on the children is very desirable.

Then, too, the electrical contractor and dealer should not neglect to take an active interest in looking into methods of school support and in being a factor in its upward progress. Perhaps a school bond issue is being voted on in your home district—did you bother to vote for it? Better support is being asked for our schools everywhere—are you giving it? The Junior College movement is a peculiarly western institution. It is designed to meet the needs of the workman who will fill a place in life somewhere between the artisan and the professional man. The high school can cover only the most elementary of technical work; the university does not touch the field at all except as it interests the professional man. This intermediary school could be made industry's very own—confess that you do not know whether your city possesses such an institution, nor why it does not. Under the Smith Hughes law in California for instance, special courses in vocational work—the work of your vocation as well—are to be included in the school curriculum. Do you know that appointments and policies under that act are now being shaped in our state capitals? All this is the merest good citizenship—but it is also good business. And the electrical contractor and dealer cannot afford to overlook it.

Waste of industrial effort that we all decry so at the present time is still discernible in many quarters.

The Portability of the Electric Motor

Comment has before been made in these columns relative to the use of the electric drive on temporary jobs and its consequent saving in time, energy and money.

The recent loss of considerable sums of money by contractors handling certain temporary construction work in the building of dams is directly traceable to either ignorance concerning the adaptability of the electric motor or prejudice in favor of other less efficient means of operation.

So much of the present industrial activity is of a nature that is temporary in character that the power

salesman is overlooking such installations in many instances. Used motors, kept on tab by the commercial department for just such work, often prove of great value not only in promoting income for the company but by increasing the efficiency of human effort in the present industrial trials of the nation. No better patriotic move could be made to help win the war.

Let each one that reads this editorial go over in mind again not only the junk heap with its possibility of salvage but, when an idle motor is observed, see if its use due to its portable character can not be made to do a greater service. Thus will the power company, the industry and the nation jointly profit in this lessened idleness.

The extreme height to which the modern concrete dam has been built brings out each day new and interesting problems. In the West where storage supply has as a rule been developed only as need for it has arisen the subsequent additions to concrete dams offer an unusual problem that today is not wholly disposed of in dam design.

Two instances of current interest to engineers are the Huntington Lake Dam of the Southern California Edison Company and the Spaulding Dam of the Pacific Gas and Electric Company. In both these structures an additional height of dam is contemplated. In fact at the former dam work is now under way in its raising to greater height.

Since these dams are used for storage purposes it is of course evident that the pressure at the center of the arch is greater when the reservoir is full as compared with little or no storage. As a consequence the elastic give known to exist in such instances makes the proper distribution of burden upon subsequent additions to the dam a problem of much thought and study.

In the case of the Spaulding dam by means of coils buried in the concrete an investigation has been made to determine the temperature at which the setting of the concrete takes place, and with this factor determined the total shrinkage due to temperature and natural shrinkage thus make possible the determination of factors to be allowed for in the subsequent joining of additional elements built up in the rear from the foundation in order to carry the extra height of dam, so that this new element may carry its proper share of the load.

The manner in which this problem is being solved by various engineers of the West is being watched with unusual interest.

THE NEW JOURNAL SERVICE: The entire electrical industry is founded on patents, old and new. The importance of understanding patent law, the methods of application, renewal, etc.—to the man who deals with patented material as well as to the inventor himself, has led the Journal of Electricity to arrange for a series of articles on this and related subjects. The current number contains a general discussion of Patent Law by Wm. K. White and H. G. Prost and subsequent articles in our coming issues by this prominent firm of patent attorneys will cover such subjects as: Applications for Letters Patent, The Specification, The Claims, Actions by the Patent Office, Amendments and Arguments, Appeals, Renewals and Reissues, Assignments and Licenses, etc. Recent inventions of interest to the electrical industry, particularly those which emanate from the west, will here be featured and discussed authoritatively. This is a unique service of its kind and with the constant development in the electrical industry, should prove of timely value to our readers.

Special care is being given the question of prompt and perfect delivery. Should any subscriber fail to receive the Journal of Electricity promptly and regularly, he should communicate immediately with the Service Department, Technical Publishing Company, San Francisco.

CONSTRUCTION OF A UNIQUE POWER PLANT

(New records in hydroelectric achievement are constantly being established throughout the West, now recognized the world over for its romance and daring in engineering accomplishment. Here are interesting and unique features of a new power plant of the Pacific Gas & Electric Company which is situated immediately below the great Spaulding Dam. The power house is located in an enclosure hewn within a granite ledge. The water turbine unit, especially equipped with bypass valves, uses a head which may vary from 180 ft. to practically nothing.—The Editor.)



J. P. Jollyman and the Giant Glacial Boulders near Spaulding

IN the issue of the Journal of Electricity for September 30, 1916, an account was given which set forth in detail the several proposed power house units of the Spaulding Lake development of the Pacific Gas and Electric Company.

The early completion of the Spaulding Power House situated immediately below the giant Spaulding dam is being followed with unusual interest by engineers generally, not so much due to the size of unit

that is being installed, since its output is modest in proportion, but due to the unusual and unique features involved in design and construction.

Briefly these features are the erection of a snow shed for the workmen and operators to go to and from their work during winter months, the method of conveying the material to the power house over a precipitous granite slope, the boring or chiseling of the power house itself situated wholly within native granite, the installation of a vertical water unit when preparation had been made for a horizontal unit, and design for the operation of the hydraulic unit under a variable head which may at times be 180 ft. and at other times nothing.

As may be observed in the illustration the power house is situated below the Spaulding dam and since the waters of this reservoir are drained by a pressure tunnel, driven through solid granite to a point at which the power house is located and then carried by tunnel for some thirty-three hundred feet more, it has been necessary to chisel out an interior operating room some twenty-five feet high and thirty feet in breadth, cutting into a depth ledge about seventy-five feet in order to properly tap the pressure tunnel from the Spaulding reservoir.

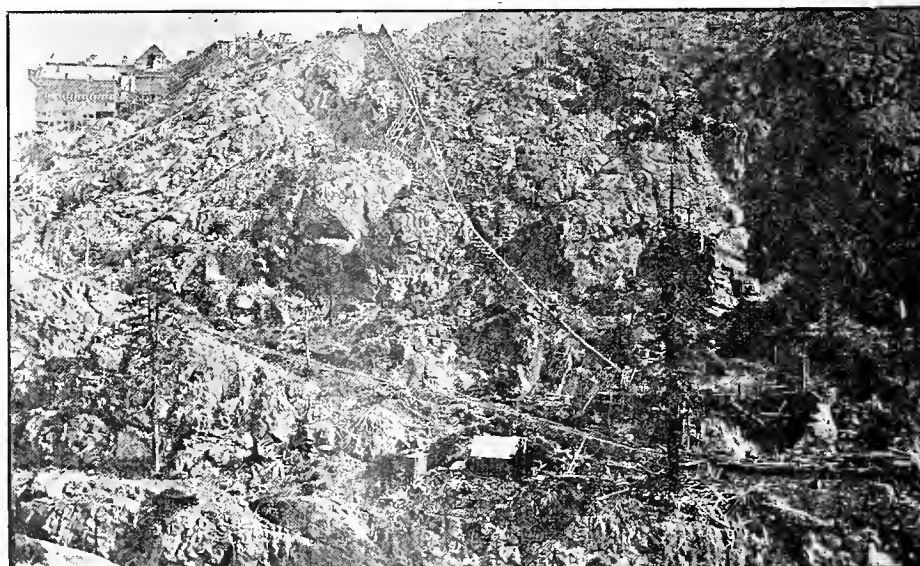
That the power wires may be taken from this house of rock without obstruction from the winter snow a concrete tower 48 ft. high over all is built at the main entrance.



Lowering the Heavy Machinery by Skids over the Precipitous Granite Ledge

The approach to the power house being on a precipitous granite ledge, it has been necessary to erect a line of snow sheds from the level above to the entrance below as seen in the illustration, so that the operators may go to and from their work during the winter months.

This precipitous ledge has also caused an unusual problem for the conveying of the material for installation. The material was first brought by rail to the depot above and then such articles as weighed less than five tons were conveyed by cable to the tram below as shown in the illustration. On the other hand the heavier material was lowered on a skid to the tram

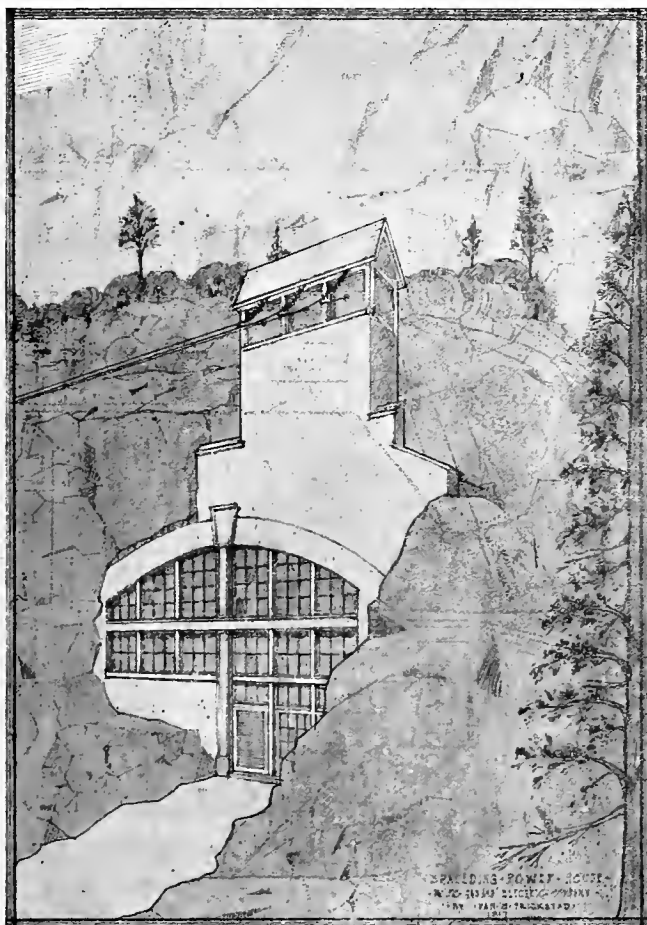


THE POWER HOUSE AND THE GRANITE LEDGE

Here may be seen the power house front emerging from the granite walls in the lower right hand corner, while to the left above are the giant Spaulding dam, the tram, the skidway, the snow sheds and the rock crusher.

and then installed in place within the granite enclosure

Due to the fact that preparation in design had been made for a horizontal 5000 h.p. unit, the later change over to a vertical unit made several unusual



The Power House Front Emerging from the Native Granite

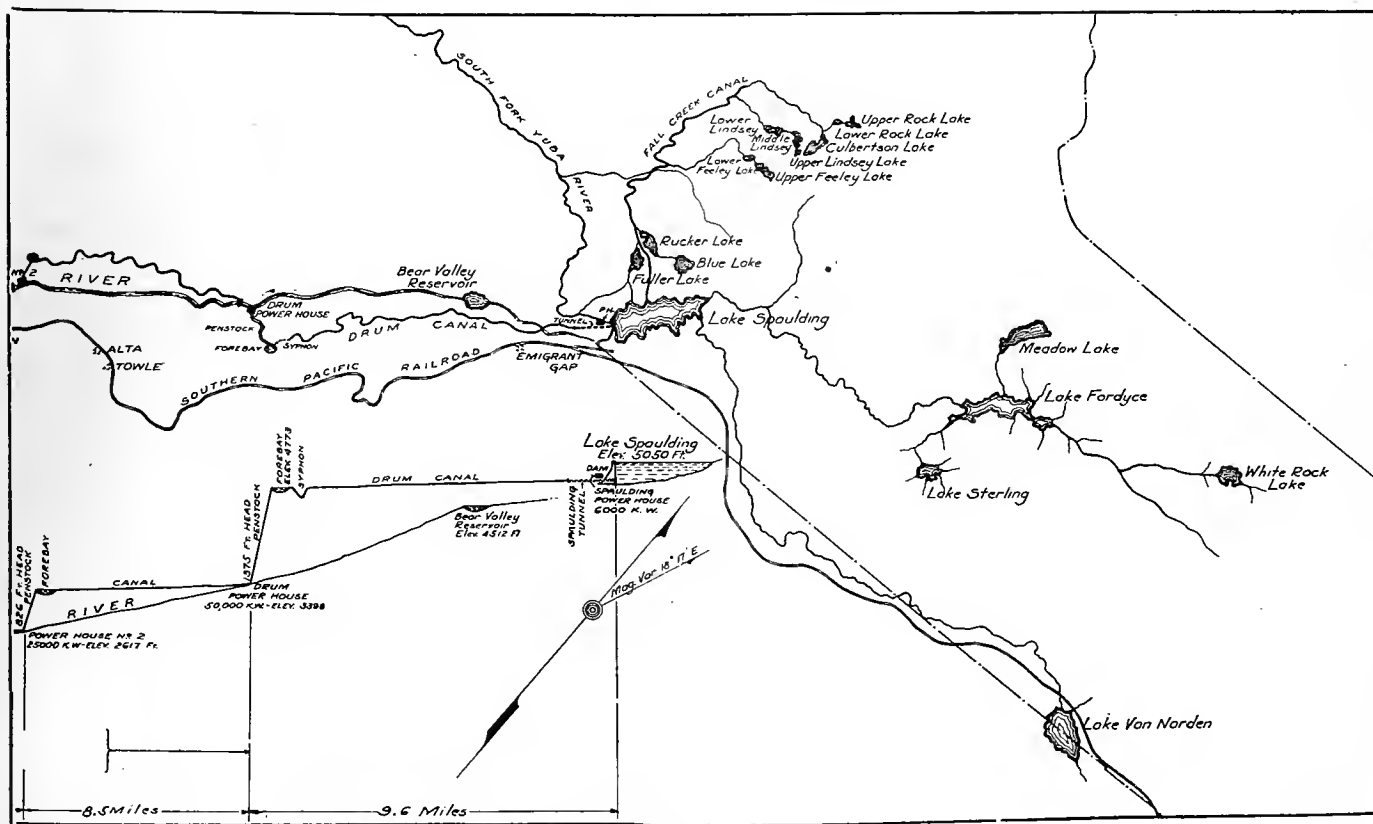
problems arise because of the granite walls encountered on all sides. The lowering of the turbine shaft into place for instance was accomplished by removing

the hook on the traveling crane. Physical connection between crane and shaft was effected by bolting the crane stub to the shaft, bored and grooved specially for the work.

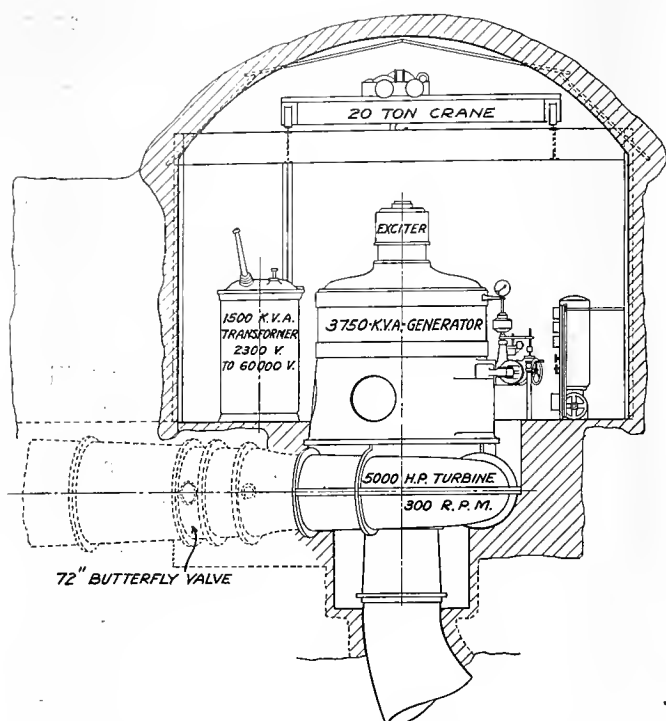
But the unique feature of this plant is its ability to operate on a variable head. While theoretically it is designed to operate between 180 ft. and zero, practically speaking the lower head will never be less than 50 ft. and probably not below 75 ft. The plant will be operated solely with reference to the requirements of the power houses farther below, which are Drum, Halsey and Wise. In other words the water necessary for the operation of these lower plants will be passed from Lake Spaulding into the pressure tunnel and then as much power as is possible at this station will be generated. A bypass has as a consequence been established for controlling the water not necessary for power generation. It is assumed that the variable head will not alter over a day's run to such a sufficient degree as would necessitate a change in bypassing the water to any great degree. The bypass arrangement of the valves will automatically open, actuated by the governor which is of the Pelton type as is also the turbine unit. As the governor closes the gates of the turbine, it simultaneously opens these relief valves in such a manner as to give a constant supply of water to the power houses in the system below.

The generator is of the General Electric design and is mounted directly on the vertical shaft, passing through the turbine unit. Its rated capacity is 3750 kva., 2300 volts, and has an operating speed of 300 r.p.m.

The oil switches are installed with disconnecting by-passes so that they may be put out of commission at any time without shutting down the plant.



Map of the Upper Spaulding Development



The New Installation in Cross-section

The three transformers are of the Westinghouse design and transform from 2300 volts delta to 60,000 volts Y with grounded neutrals. Horn gap lightning arresters are installed with water columns arranged in such a manner as to give steam vent in order to maintain a one ampere discharge current.

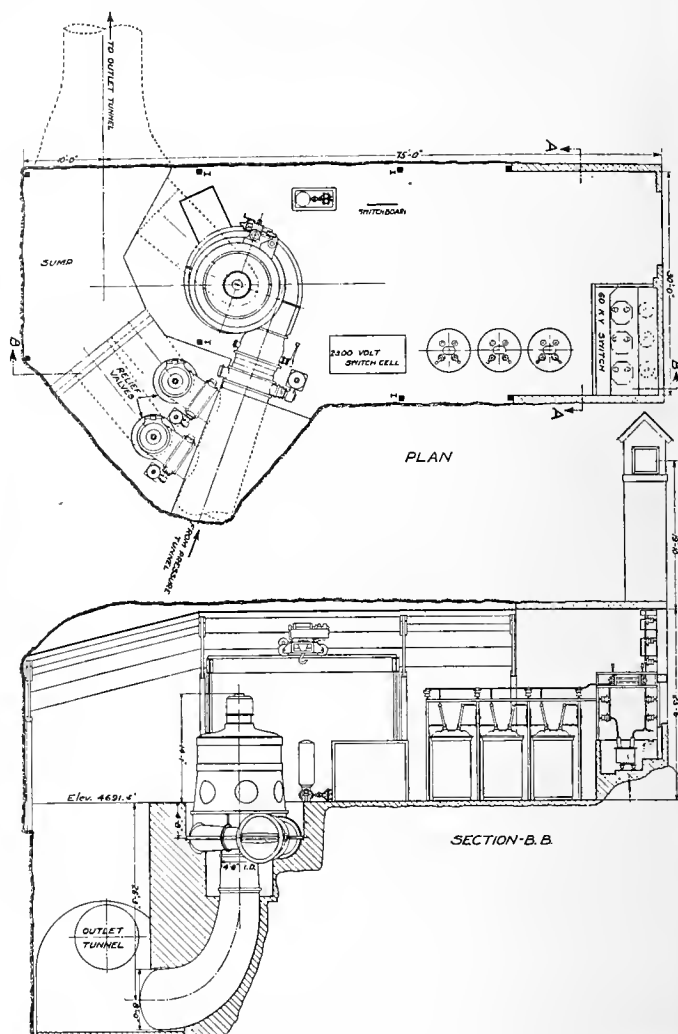
The draft tube is unique in that a section 4 ft. long is of cast iron and split so as to make its removal a matter of minimum effort in case of emergency.

The working adit of the long tunnel, driven when the main work was under construction, is now used as a sort of a spillway for the power plant and also to offer a possibility of shunting all the water from the remaining length of the long tunnel should occasion arise for this necessity.

In comparing this installation at the outlet of Lake Spaulding with the Wise power plant, located at the lower end of this chain of power plants, it is extremely interesting to observe that while the Wise power plant, housed in the open, operates on a constant head, has a water wheel unit of the single discharge type the largest in existence, obtaining its water supply through a penstock pipe over a mile and one-half in length, this installation, housed within a granite ledge, designed for a head that is totally variable, has an hydraulic unit only of medium size, and obtains its water supply through a penstock pipe of practically no length at all, unless indeed the column of water in the pressure tunnel of 1100 ft. be taken into account, and yet over one-fourth the power of its giant competitor is recovered from the passing energies of the water in the pressure tunnel.

Such installations as this, once again demonstrate the genius and versatility of the engineer and add again new laurels to the page of romance and efficiency in the engineering annals of the West.

The work has been very efficiently handled under the direction of P. M. Downing, as chief engineer, J. P. Jollyman, in charge of electric construction, R. C.



The Plan and Elevation of the New Spaulding Power House

Steele, in charge of structural features, I. C. Frickstad, in charge of architectural design, O. W. Peterson, construction superintendent, and Henry Van Erkelens, general foreman.

CRACKING HYDRO-CARBONS BY ELECTRICITY

According to the Gas Age, a process which will obtain by means of an electric discharge a greater yield of fixed gases from hydro-carbon vapors is the development of J. G. Davidson and R. W. Ford of Vancouver, B. C., Canada. By passing such vapors through an electric brush discharge field the amount of non-condensable gases is increased. In actual tests it is claimed that by this process the amount of CH_4 in the gas has been increased from about 25 per cent to approximately 40 per cent, while the amounts of C_nH_{2n} were increased from between 7 per cent and 10 per cent to between 20 per cent and 23 per cent. Ordinarily the gas is connected through a plurality of conduits formed as vertical pipes connected at their lower ends to a supply header and at their upper ends to an outlet header, the discharge electrode being formed as wires hung axially in the pipes from an insulated support. The pipes are grounded and the electrodes are connected by a wire to a mechanical rectifier of the usual rotary type included in the high-tension circuit of a step-up transformer, the rectifier connected to ground.

THE INCOME TAX AND YOUR INCOME

BY CHARLES P. CUTTEN

(If you earn more than a thousand a year, you are going to have to give some of it to the government—if you do not you will find that you are giving it by way of higher prices to the man who does have to pay the tax. A clear and comprehensive statement of just how this tax will affect you is given in this article, which formed part of an address delivered recently before the San Francisco Electrical Development and Jovian League. The author is state senator and an attorney for the Pacific Gas & Electric Company.—The Editor.)

The War Revenue Act of 1917 entitled "An act to provide revenue to defray war expenses and for other purposes" was approved by the President on October 3, 1917. It went into effect, except as to the taxes where the effective date will be given later, on October 4, 1917.

The act levys a number of distinct, direct taxes specified in the act as follows:

1. War Income Tax.
2. War Excess profit Tax.
3. War Tax on Beverages.
4. War Tax on Cigars, Tobacco and Manufacturers thereof.
5. War Tax on Facilities furnished by Public Utilities and Insurance.
6. War Excise Taxes.
7. War Tax on Admissions and Dues.
8. War Stamp Taxes.
9. War Estate Tax.
10. Postal Rates and Income Tax Amendments.

The act creating the War Income Tax of 1917 and amending the Income Tax Act of 1917 provides two distinct and separate income taxes. In addition to the normal tax of 2 per cent, under the 1916 law, a war normal income tax of 2 per cent is imposed on individuals making the total normal tax on individuals 4 per cent. In addition to the additional taxes, under the 1916 law, new war additional income taxes are imposed. Without going into all of the percentages applicable to incomes, under the income act of 1916 and the income act of 1917, I will give you an illustration to show how the act will operate.

Assume that a married man having two dependable children, one under 18 years of age and the other over that age but mentally defective, making a return as the head of a family, has an income of \$10,000, derived from the following sources:

Salary	\$ 6,000
Interest on U. S. and Municipal bonds (tax exempt).....	2,000
Dividends on Stock	2,000
	<u>\$10,000</u>

The man's income tax should be computed as follows:

Normal Tax.	1916 Law	1917 Law
Personal exemption.....	\$ 4400	\$ 2,400
Interest on Bonds.....	2000	2,000
Dividends on Stock.....	2000	2,000
(Normal Tax does not apply).....	\$ 8400	\$ 6,400
Amount subject to Normal Tax.....	\$ 1600	\$ 3,600
Normal Tax of 2%.....	32	72
Securities not subject to additional tax (U. S. and Mun. Bonds)	\$ 2000	2,000
Total Income Subject to additional tax.....		\$ 8,000
1% from \$5000 to \$7500.....		25
2% from \$7500 to \$8000.....		10
Total additional taxes		\$ 35
Summary.		
Normal Tax—1916 Law		\$ 32
Normal Tax—1917 Law		72
Additional tax—1917 Law		35
Total Tax		<u>\$ 139</u>

The new rates on individuals apply to the calendar year 1917 and subsequent calendar years. The provisions for personal exemptions accorded to individuals under the 1916 law are amended by providing in addition to the exemption of \$3000 to unmarried and \$4000 to married persons or heads of families; an exemption of \$200 to heads of families for each dependent child under 18 years of age and for each child mentally or physically defective.

Under the new war income tax of 1917 the exemptions are \$1000 to unmarried and \$2000 to married persons or heads of families with an additional exemption of \$200 to heads of families for each dependent child under 18 years of age and for each child mentally or physically defective. There is some doubt whether the \$200 exemption for a minor or defective child is allowed under the war income tax. It is believed, however, that under a fair construction of the act it will be allowed. Similar personal exemptions are allowed to guardians and trustees for each ward or beneficiary. The estates of deceased persons are accorded an exemption of \$3000 under the 1916 act and \$1000 for the new war income tax. Returns will be required for all individuals having a net income of \$1,000 or over if unmarried or living apart from husband or wife and \$2000 or over if married or the head of a family. Certain material amendments have been made to the 1916 income tax law. Interest paid on indebtedness incurred for the purchase of securities exempt from tax can no longer be deducted. There is doubt whether this provision extends to indebtedness incurred in the purchase of stock, as the dividends from the stock are only exempt from the normal tax and being subject to the additional taxes cannot strictly be said to be exempt from taxation.

No deduction will be allowed for income and war excess profit tax paid during the year, but in assessing the income tax the net income embraced within the return will be credited with the amount of any war excess profit tax assessed upon the tax payer in the same calendar or fiscal year, and in the case of partnership profits with the proper proportionate share. The net result of the two provisions is that the Internal Revenue Department will subtract from income, before assessing the income tax, the amount of any war excess profit tax which may have been assessed against tax payers for the same calendar or fiscal year. The provisions of the 1916 law relating to the withholding at the source, excepting those affecting non-resident aliens, and in the case of interest on bonds or other securities containing the so-called "tax free covenant" are repealed, and in lieu thereof, provision is made requiring information at the source.

Contributions or gifts made to religious, charitable, scientific or educational institutions, etc. to an

amount not in excess of 15 per cent of the tax payer's taxable net income, computed without deducting such gifts, are allowed as deductions under regulations to be issued by the Internal Revenue Department.

Income Tax on Corporations

In addition to the tax of 2 per cent, provided in the 1916 law as amended, there is imposed by the 1917 law a war income tax of 4 per cent making the total income tax on corporations 6 per cent of net earnings. An additional tax of 10 per cent is imposed upon the amount of net income of every corporation received during the year which remains undistributed 6 months after the end of each calendar or fiscal year, except such income as is actually invested in the business or is retained for employment in the reasonable requirements of the business or is invested in United States Bonds issued after September 1, 1917. Under the war income tax of 1917, the income of corporations shall be credited with the amount of dividends on capital stock of corporations which are taxable under that act. This provision does not apply to the act of 1916 as amended.

War Excess Profit Tax

The present excess profit tax of March 3, 1917 is repealed. All corporations and individuals carrying on a business or trade are taxable except:—

1. Corporations exempt from taxes under the provisions of Sec. 11 of the 1916 income tax law and partnerships doing similar business;
2. Compensation of Government employees, state, federal, city, etc.;
3. Business carried on by
 - (a) A corporation, the net income of which, during the taxable year, is less than \$3000.
 - (b) A partnership or individual having a net income from trade or business during the taxable year of less than \$6000.
4. Business organized since January 1, 1913, the net income of which is less than 8 per cent of actual capital invested for the taxable year plus \$3000 in the case of corporations and plus \$6000 in the case of individuals and partnerships.

The basis of the tax is invested capital, which means under the law, "actual cash paid in" and the actual cash value of other property where cash has not been paid for such property. Before the excess profit tax is figured, a deduction from the net income is allowed in an amount equal to the same percentage of invested capital for the taxable year which the net income for the pre-war period bears to the invested capital for such period. But such deduction shall not be less than 7 per cent nor more than 9 per cent of the invested capital of the taxable year. There is also allowed a further deduction of \$3000 in the case of corporations and \$6000 in the case of individuals and partnerships. The rate of tax will be as follows:

1. 20 per cent of the amount of the net income in excess of the deductions explained above and not in excess of 15 per cent of the invested capital of the taxable year.
2. 25 per cent of the amount of the net income in excess of 15 per cent and not in excess of 20 per cent of such capital.
3. 35 per cent of the amount of the net income in excess of 20 per cent and not in excess of 25 per cent of such capital.
4. 45 per cent of the amount of the net income in excess of 25 per cent and not in excess of 33 per cent of such capital.

5. 60 per cent of the amount of the net income in excess of 33 per cent of such capital.

A brief example will illustrate the method of computing the tax.

Assume a corporation whose average pre-war net income was \$1,000,000 which earned in 1917 \$4,600,000 and that the invested capital for the pre-war period was \$12,500,000 and in 1917 it was \$15,000,000.

It will be noted that the earnings of the corporation during the pre-war period were 8 per cent on the invested capital for such period.

1917 net income.....		\$4,600,000
Deductions:		
8% of \$15,000,000.....	\$1,200,000	
Specific deduction of.....	3,000	1,203,000
		<hr/>
		\$3,397,000
Tax Computation.		
20% of net income not exceeding 15% of \$15,000,000, or	\$2,250,000	
Less above deductions.....	1,203,000	Am't of Tax
		<hr/>
Amount taxable at 20%.....	\$1,047,000	— \$ 209,400
25% of net income on 5% of \$15,000,000 or	\$ 750,000	— 187,500
35% of net income on 5% of \$15,000,000 or	750,000	— 262,500
45% on balance of net income which does exceed 33% of \$15,000,000, or.....	850,000	— 382,500
		<hr/>
Totals	\$3,397,000	— \$1,041,900

It is provided that a trade or business having no invested capital or not more than a nominal capital shall, in lieu of the tax herein provided, be taxed at the rate of 8 per cent on net income after allowing for the specific deduction of \$3000 or \$6000 for domestic corporation or partnership or individual, as the case may be. It is believed that the above tax of 8 per cent applies to all salaries above \$6000 except in the case of exempt government officials or employees. If this construction of the act is accepted, it will mean that a professional man with a taxable income of \$10,000 or a salaried official drawing a taxable income of \$10,000 a year would have to pay in taxes \$120 under the act of 1916 \$235 under the war income act of 1917 and \$320 under the excess profit act of 1917, making a total of \$675 in direct government taxes. Of course, if he pays interest or taxes, his taxable income will be correspondingly reduced. If, however, he received \$10,000 from investment, his tax would only be \$355.00.

War Tax on Facilities Furnished by Public Utilities (Effective Nov. 1, 1917.)

These taxes are to be paid by a person paying for the service. Express—from a point to another point in the United States for each 20 cents paid therefor 1 cent. Freight—from a point in the United States to another in the United States on amount paid therefor 3 per cent. Pipe line—for the transportation of oil by pipe line on amount paid therefor 5 per cent. Seats, berths or state-room tickets in sleeping or parlor cars or on vessels on amount paid therefor 10 per cent. Telegraph, telephone or radio dispatches and messages originating within the United States—each message or dispatch of 15 cents or more, on amount paid therefor 5 cents.

On life insurance the tax will be 8 cents on each \$100 or fraction of the amount of the policy. On marine, inland and fire insurance 1 cent on each dollar or fraction of the premium charged. On casualty insurance 1 cent on each dollar of the premium charged. These taxes are paid by the corporations or associations which issue the policies.

BETTER OFFICE METHODS

BY H. H. WADE

(More effective study in the daily dispatch of office routine is the crying need of the hour. Here is an excellent series of suggestions by the assistant auditor of the Portland Railway, Light & Power Co. which should prove helpful to all engaged in the study of improved office methods. These suggestions were embodied in the recent compilation of wrinkles for the convention of the Northwest Electric Light and Power Association at Spokane.—The Editor.)

About June 1st, 1916, a new head was appointed to supervise the work of auditing conductors' accounts, a sub-department under the general auditor. The time seemed appropriate to make a thorough study of the work of this department, to determine:

First: Whether the various operations involved were properly co-ordinated.

Second: Whether the clerks were engaged in the operations to which each was best adapted.

Third: What methods might be employed to speed up the work, to the mutual benefit of employees and the company?

Taking these three subjects in order:

First: With the exception of a few minor changes, we found no need for changing the routine of the work.

Second: In order to form an intelligent opinion as to the relative efficiency of the individual employees, we at once concluded that some daily record was necessary which would show just how much of each operation was performed by each clerk; the time required to do it; and the character of the work turned out, as to accuracy and legibility.

It might be well to explain, for the benefit of those who are not familiar with the detail of the work being described, that, with us, the auditing of the conductors' accounts consists of a comparison of the actual daily turn-in of each conductor (cash, tickets and transfers) with the amounts of each which have been recorded on the fare register.

Our check sheets are so arranged as to provide parallel columns for the recording of actual amounts turned in side by side with amounts called for by the register.

With the above arrangement in mind, it will be clear to the reader that any mistake, whether made in counting, entering, or in balancing the sheets, would result in a discrepancy appearing, as between the conductors' turn-in and the amount registered.

Before charging the conductor with such discrepancies, we first re-check all such differences so as to be certain that no mistake has been made in the office work.

From the above, it is obvious that all mistakes in the above work would be about on a par, so far as their cost is concerned.

During the first two months we required each clerk to keep an accurate record of all work performed, on a specially printed blank, which provided for the following columns:

Date Operation Start Finish Time Quantity

At the end of two months our sheets, together with our personal knowledge of the work and the prevailing conditions, enabled us to establish a standard of quantity per hour (or other unit of time) for each operation. This standard was established at a point sufficiently high to demand close attention and consid-

erable ability, but not at a point impossible of accomplishment without detriment to the worker. In other words, our aim was to make our standard possible of attainment to a first-class clerk.

Having now a medium for measuring the quantity of work turned out by each clerk and a standard performance for each operation, it remained only for us to combine this information with the information available relative to the accuracy and legibility of the work, and such general matters as general conduct, neatness in appearance, etc., in order to gauge the efficiency, or value to us, of each clerk. We therefore added to our original sheet showing the working record, the following columns, to be filled out by the head of the department:

Speed	Accuracy	Legibility	General Conduct	Neatness in Appearance
25%	50%	10%	10%	5%

Any clerk attaining the standard in all operations, without errors, who at the same time meets the conditions required in the other matters, is given a rating of 100 per cent. It was necessary, however, for us to apportion this total of 100 per cent to the various qualities, and we did so, as shown above.

Because of the cost entailed in re-checking occasioned by errors, we decided to place a value of 50 per cent for complete accuracy (errorless work) and to reduce this 50 per cent 5 per cent for each error made.

Realizing that speed was a most valuable quality we assigned to it a value of 25 per cent. The attainment of the standard entitled the clerk to the full 25 per cent and any failure to reach the standard reduced the 25 per cent proportionately.

Legibility, because of its value in reducing the liability for misreading figures, was assigned the value of 10 per cent. The full 10 per cent is allowed, unless, in the judgment of the department head, a carelessly made figure contributed to an error or caused delay.

In assigning 5 per cent to "Neatness in Appearance" we took cognizance of the psychological effect of cleanliness and trimness. As practically all of the clerks are young ladies, failures to earn the full mark of 5 per cent are rare.

From the very first the individual records have been the source of great interest to the clerks. A constant improvement in the work of every one has been very noticeable, and the competitive spirit has been strong. A comparative statement for the last five months gives a clear indication of the improvement in the work.

	Sept.	Oct.	Nov.	Dec.	Jan.
Average (all clerks).....	95.6%	97.3%	97.7%	98%	97%
Number of errors.....	411	194	169	150	205

It will be noticed that the January showing fell below previous months. This is explained by the extra efforts required to dispose of the work occasioned by the holidays and also by much sickness in

January, which amounted to nineteen days. That the work was completed without extra help is a decided tribute to the new conditions.

In order to fully appreciate the above improvement it is also necessary to take into consideration the facts that during the above period the force was reduced, with a salary saving of \$261.50 per month, and that the work was increased approximately 3 per cent by the addition of nine more cars to the schedules.

In January of this year we decided to put a bonus system into effect, in recognition of the good work being done and as an incentive to its continuance. For this purpose we established two classes, because of certain conditions under which one class (transfer clerks) worked at a disadvantage. The following bonus was offered:

For General Clerks:				
Clerks attaining a monthly average of	99 %	\$2.50		
" " " " " "	99½ %	3.50		
" " " " " "	100 %	5.00		
For Transfer Clerks:				
Clerks attaining a monthly average of	96 %	\$ 2.00		
" " " " " "	97 %	3.00		
" " " " " "	98 %	4.00		
" " " " " "	99 %	5.00		
" " " " " "	100 %	10.00		

The bonus plan has now been in operation for two months. It has been well received by the clerks, and is unquestionably fulfilling its purpose, i. e., to stimulate the clerks into putting forth their best efforts and at the same time offering them a reward for their successful accomplishment of their tasks.

The writer does not pretend to any particular knowledge of so-called "scientific management," but he does thoroughly believe in the common sense rule of knowing, as nearly as practicable, exactly what value each employee has for his employer, in work turned out. The writer has always believed in the competitive spirit among fellow workmen; or, expressed in another way, making a game of work.

ELECTRICITY ON THE FARM

In a recent article in the Idaho Engineer, C. O. Crane gives some idea of the main uses to which electricity can be put on the farm:

One cent's worth of electricity at 10 cents per kilowatt hour will operate in the farm house:

One 16-candlepower mazda lamp for five hours.

A 6-pound flatiron 15 minutes.

An electric washer having a capacity of 12 sheets to the washerful long enough to wash 20 sheets.

An electric vacuum cleaner long enough to clean 450 square feet of carpet.

A pump long enough to raise 100 gallons of water 100 feet.

A radiant toaster long enough to produce 10 slices of toast.

A sewing machine two hours.

A 12-inch fan for two hours.

An electric percolator long enough to produce 6 cups of coffee.

A heating pad from 2 to 4 hours.

A domestic buffer and grinder for 1½ hours.

A chafing dish 12 minutes.

A foot warmer for one-half hour.

In the dairy, electric milking comes first, of course, then electric churns, cream separators and cold

storage plants. In the shop the farmer should have an electric soldering iron, grindstone, forge blower and portable drill.

An electric motor should operate feed grinders, corn shellers, threshing machines, hay hoists, root cutters. The motor vehicle should be electrically run—the plow certainly. Electricity should provide heat for the poultry incubators and brooders.

Above all, the farmer should possess an electrically driven pumping plant to give him water for his irrigation just when he wants it.

In proof that the farmer is taking advantage of these applications statistics from Idaho are quoted:

There are now 1,770 rural customers using current for lighting residences and barns, 273 for domestic power, 312 for irrigation, 18 for grinding feed, 130 for cooking and water heating, 80 for washing machines, 1,220 for flatirons, and 1,060 for some of the other labor-saving domestic appliances.

PROCEDURE WITH GERMAN OWNED PATENTS

Legislation now before Congress provides for the prohibition of all trading with the enemy. Credits may not be extended, contracts made or debts paid or collected. Exceptions to the prohibitions of the bill are made expressly in connection with patents, trade-marks, and copyrights. A person in Germany may file in the United States an application and may prosecute it, paying both official fees and fees of attorneys. If conditions attending the war prevent him from filing application, he may be granted a total period of 14 months after the war in which to act. These privileges are conditioned upon extension of like privileges by Germany to Americans. A special procedure is provided in order that there may be use of American patents, trade-marks, and copyrights, owned by persons in Germany. This procedure contemplates that citizens of the United States may apply to the agency the President designates for a license. If the grant is decided to be for the public welfare, a license to use may be issued, and may be exclusive or otherwise, according to circumstances. To the license conditions may be attached, including the price at which products may be sold. A licensee will file reports regarding his use, and will pay periodically to the Alien Property Custodian sums which are not to exceed 5 per cent of gross receipts from sales, or 5 per cent of the value of use as determined by the President. The owner of a patent, etc., under which a license is issued may within one year after the war ends file suit for a reasonable royalty in the federal court of the licensee's district.

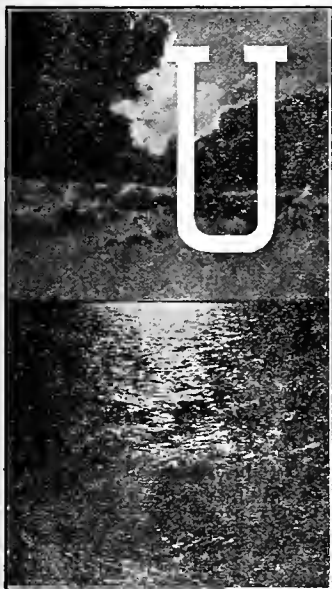
TYPES OF LAMPS USED IN PARK LIGHTING

Some interesting figures on the types of lamps used for lighting parks are contained in a recently issued bulletin of the U. S. Census Bureau. The following statement shows the per cent relation of the number of lamps of each type:

Type of lamp.	Per cent of total number.		
	Park lighting, 1916.	Street lighting, 1909.	Street lighting, 1907.
Electric arc	8.5	34.5	34.2
Incandescent electric	80.1	16.3	10.6
Gas	6.2	41.5	45.1
All other	5.3	7.7	10.1

SHORT JOURNEYS IN PACIFIC LANDS

STOPPING PLACES FOR THE ENGINEER IN YOKOHAMA



Between Stopping Places—
Moonlight on the Pacific

UPON arriving at Yokohama, the little brawny brown swimmers who meet the boat at Honolulu have now given way to a gleaming, smiling row of little brown men with big thatched hats that seem to rest in space about two inches above the wearer's head without any visible means of connection between the hat and the anatomy of the human figure before you. Upon stopping to listen to their cry, you finally come to the realization of what they really want you to do. What they want you to do is this: to get in the

over-grown, two-wheeled baby carriage they are pulling and they will take you to the Grand Hotel!

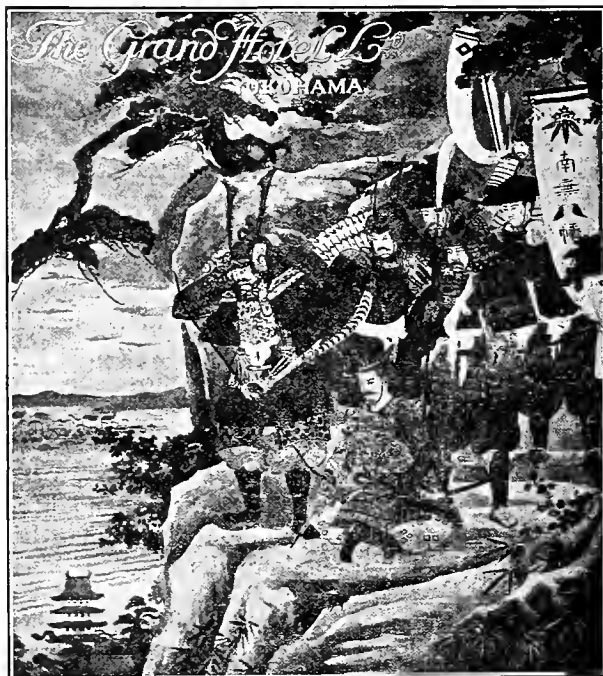
I was, however, like the girl of immortal fame, "willing to try anything once." Upon arriving at the hotel in this particular kind of "pullman" special, I came to the conclusion that the soft tread of the human mechanism before me and the easy springy motion of the rickshaw were an experience long to be cherished in the annals of experience in lands far from home.

The Grand Hotel is Dignified and Well Appointed

At the Grand Hotel, situated along the famous "Bund" or water front of Yokohama, the view is truly delightful. The hundred islands that sink away in the distant horizon awaken one to the charm of the new surroundings. The busy ships loading and unloading cargoes on all sides, flying strange new flags from their masts, remind one that he is indeed far from home. The warships quietly at anchor the day I spent at the Grand served not to waken even a single pang that in scarcely two months there would be enacted the world's greatest tragedy, and that the white cleanly decked cruiser lying so peacefully at anchor before our eyes, should so soon be ruffled by every angry passion that at such times grips the human breast, to go down in history as "Emden, the scourge of the seas."

And so in this peaceful frame of mind we prepared for the evening meal. Accustomed to American hours we repaired to the spacious dining room at six-thirty o'clock to find the delightful music being rendered was not for the evening meal, but was the occasion of a brilliantly gowned and groomed exhibition of the dansant, participated in by the elite of the foreign residents of Yokohama.

At seven o'clock the dansant adjourned and was followed at seven-thirty (this is the usual time for the evening meal in the Orient) by the formal meal of the hotel. The menu card furnished was delightfully decorated in Japanese colors of red, blue, and green, and represented some of the mythological life of Japan. Upon the inside was to be found the names of the ten selections of music excellently rendered by Dziurzynski, the band-master. On the opposite side were listed the thirty-six tempting dishes which comprised



Menu Card at the Grand Hotel, Yokohama

the evening Table d'Hôte dinner. In passing, it is to be noted that the dishes are all numbered for the practical reason that the waiters do not all speak fluent English. Since, however, they can carry the numbers in their heads better than the names of the dishes, this gives a certain and sure escape from the embarrassment that would arise over bringing the wrong order.

The central location of this hotel puts it in easy reach of all points of interest in Yokohama, whether you are upon pleasure or business bent.

The Bluff Hotel Offers a Quiet and Delightful Retreat at Yokohama

If one should desire an informal residence in Yokohama somewhat removed from the business district, the Bluff Hotel will be found most reasonable and satisfactory. Overlooking the city of Yokohama in one direction and Mississippi Bay of Commodore Perry fame in the other, a more healthful, wholesome surrounding could not be found. The furnishings are not at all ambitions but nevertheless one has all the things necessary for his comfort. The meals, while served with simple easy taste, are yet most wholesome and delicious.

POWER DEVELOPMENT IN PERU

Arriving at Callao, Peru, I was much impressed with the good dock facilities there for handling freight from ships to railroad cars. Our ship, however, did not go to the dock for some reason unknown to me, but lay outside while the passengers with their baggage were unloaded in small boats. This condition is retarding transfer unnecessarily.

The custom house was not difficult to pass through, and very soon I found myself in a country new to me. Going up the valley along the Rimac River as far as Chosica, the soil looked as if anything would grow on it if irrigated. Irrigation is used here to a great extent, the water from the Rimac River being used. Whether all of the water is used, I do not know, but even so, more could very likely be developed by storing the flood waters in reservoirs up in the mountains. From Chosica the railroad begins to climb the steepest grades, at times as much as 4 per cent, and in a few hours brings a person from almost sea level to an altitude nearly 16,000 ft. This Peruvian Central Railroad follows the Rimac River, and is a great piece of engineering and construction work; it has taken quite a bit of nerve to go out and locate it, as the mountain sides are steep and rugged everywhere and difficult to climb. Bridges over deep ravines follow tunnels through cliffs, and it should be noted too, that these tunnels where lining was necessary, are lined with cut stone in the most substantial manner.

In front of all passenger trains going down hill a small hand car is run by gravity with one or two inspectors on to ascertain that there are no broken rails or other defects in the line. The Rimac River drops above Chosica for a long distance at the rate of about 300 ft. per mile and carried in the latter part of July, 1912, about 250 cubic feet (estimated) of water per second. This is supposed to be the low water season. Out of this river it would be possible to develop 6000 h.p. per mile with modern hydroelectric machinery. Probably a total of 150,000 h.p. could be economically developed with comparative ease, but there is no market for the power at the present time within a commercial transmission distance. Lima receives waterpower from this river from two stations located near Chosica. The drop in the river per mile at this location is not very large, but the transmission line to Lima is short. It has been suggested that the Peruvian Central Railroad should use waterpower for the propulsion of trains on their railroad, but their traffic is not heavy enough at the present time to warrant the extra investment in hydroelectric machinery.

Coming near to the summit the copper smelter of the Bachus & Johnson Company is passed. These two men I understand are principally responsible for the location and engineering of the Peruvian Central Railway and now they seem to be quite successful in digging copper out of the hills all around.

After reaching Oroya we started out in the hills to look for what we were after. The method adopted in prospecting for waterpower was as follows: First the whole territory was gone over quickly. All rivers and creeks that had any apparent power possibilities were investigated. The volume of water flowing was ascertained by using a Price current meter for finding the

average velocity and by measuring the cross section of the stream. It was not possible to find the fall of the river very accurately when it had to be done quickly, but it was considered good enough for this first inves-



ABOVE THE TIMBER LINE

The bleak aspect of the higher Andes offers little to the beauty loving eye but holds much of interest to the engineer—for here the railroads climb the most precipitous mountain heights and undeveloped water powers lie waiting for the enterprise to utilize them.

tigation to travel up or down the stream and take barometric readings at certain intervals. The estimated speed of travel was in most cases three miles per hour and it is of course in this item the greatest uncertainties enter in.

All of the rivers and creeks in the territory in question are tributaries of the Amazon and at the time that this investigation was made, they were supposed to carry their extreme low water. While a great many of the streams investigated possessed power possibilities it was one of our duties to pick out the best for the first development and we found that all but two of the investigated streams could therefore be eliminated from further consideration after the preliminary investigation. Actual surveys were now made of the two streams found to be especially adapted for economical power development. One of these streams had three times as much fall per mile as the other one and was therefore the best from a hydraulic standpoint, but it was, however, located so far from the railroad that it was thought the hydraulic advantages it possessed would be more than compensated for by the fact that the other stream was located right along the railroad. This location was chosen and the power plant was built at this point.

GUATEMALA'S PURCHASES FROM UNITED STATES

The Guatemala market for steel rails, other steel products, agricultural implements, machinery used in connection with the coffee, rice, and sugar plantations, and practically all lines of hardware is now controlled by dealers in the United States. Before the European war much of the machinery used on the country estates, known in local parlance as "fincas," came from England, and other classes of machinery, particularly in Guatemalan breweries, came from Germany; but for the past two years practically all of this machinery has been brought from the United States.

WOMEN IN THE INDUSTRY

(With the increased employment of women in the electrical industry, new problems confront the employer. Of how much are they capable, how should they be treated, what of the situation after the war—what is the other man doing about it? This department will be devoted to the interests of women in electrical fields and of their employers.—The Editor.)



A WOMAN'S BAND AT THE UTAH STATE FAIR

Various of the big electrical companies have been encouraging all sorts of clubs and other interests among their employees, from orchestras to hiking clubs. That the musical part of this program need not be confined to the men's side of the forces is instanced by the success of this woman's band which furnished the best of music and considerable advertising at the Utah State Fair.

WOMEN AFTER THE WAR

What are we going to do when the men come back from the war? Are we forcing men out of positions where they belong to employ women at less salaries and calling it patriotic duty? To obviate such objections on the part of labor, Harry Franklin Porter of the National City Bank makes the following recommendations:—

1. Women will be employed to do what is now regarded as normally man's work only when the need is indubitable or will be as men are required for military service.

It is not in principle inconsistent to announce that, on the other hand, during the period of the war, no man will be hired for work which can be performed fully as well by a woman. A number of corporations, including several of the leading railroads, have already declared such a policy.

2. Women doing identical work will receive compensation as the same rate as the men they replace or supplement. In other words, sex will not be made a ground for difference in wage treatment.

This not only harmonizes with one of the principal demands of every organization for equal rights, but it is an assurance to the brave fellows who go to the front that their absence will not be utilized to debase the wage scale. That it may now be too high, which is undoubtedly the case in many lines, is not in point. If it is, let the readjustment be effected in frank dealing between the two parties directly concerned, without respect to sex, after the present emergency is over and industry returns to a peace-time basis. Now, at any rate, is not the time to resort to anything that savors in the slightest of subterfuge.

3. Men volunteering or selected for military service during the period of the war will be guaranteed their old or equally good positions; such absence,

moreover, will not count against their record of continuous service unless they choose not to return..

Business men need have no hesitation in taking the above stand. It is a fairly safe assumption that many of the men now going to war will not want to return to their former occupations. Months in the out-of-doors will have created the desire for work in the open hereafter. Many of the returning soldiers will undoubtedly take up farming. Nor will such a shift be without its advantages. There will also be some (may the number be ever so few!) who will be incapacitated by injuries from resuming their former occupations; for these re-education in callings adapted to their new physical limitations will be necessary—which is a tremendous problem all by itself, demanding our best thought and attention. Instead, therefore, of returning soldiers creating embarrassment for manufacturers and other employers by calling upon them to release women who in the meantime have demonstrated their efficiency and desire to retain their positions, too few of the old men perhaps will re-apply.

WOMEN AS ELECTRIC RAILWAY EMPLOYEES

The labor situation which confronts the electric railways is so serious that there seem to be but two ways out—a war bonus or the employment of women. F. W. Brooks, President of the Detroit United Railways, in a recent article in the Electric Railway Journal expressed his opinion in favor of the latter course:

Under normal conditions, women have been employed in offices as secretaries, stenographers and clerks and, to a very limited extent, elsewhere.

In the mechanical, power, and track departments, women are used extensively as clerks, and it is the opinion of our department heads that they may be satisfactorily employed in other occupations, as in coil winding, controller work, upholstering, painting and glazing, as drill hands, switchboard and dynamo attendants, oilers, wipers, and in many like occupations that do not involve heavy lifting or severe out-of-door employment.

It is my opinion that women can perform the work of motormen and conductors satisfactorily. It is a current opinion that they may become excitable and lose control of their vehicle when contending with congested traffic conditions. I very much doubt the correctness of that view. It is to be understood, of course, that they must be especially trained with respect to that condition, and it is my observation that under such conditions women are driving taxicabs and other motor vehicles as successfully as men are doing like work. Both motormen and conductors are permitted to remain seated while on duty outside of restricted congested areas, and certainly the employment is not more severe than that performed by women in factories and probably as clerks in stores.

WOMEN IN PRESENT-DAY JAPAN

So completely has Japan swung into line with Western nations that today the field of men's occupations has been greatly encroached upon by women. A Japanese vernacular paper lists 64 occupations, formerly open to men only, now available to women.

The Imperial Railway Bureau employs some 4,000 women as ticket sellers, cashiers and bookkeepers. The Imperial Tobacco Monopoly Bureau finds use for some 6,000 women who earn up to one yen (50 cents) a day in the manufacture of cigars and cigarettes. These workers have a nine hour day and after each day's work they receive an hour's training in reading, penmanship, sewing, etc. The Imperial Arsenal employs a number of women, but here the work requires muscular strength rather than agile fingers or an active brain. While the remuneration is not so high the work is more attractive from the standpoint of health than that of the Tobacco Monopoly Bureau.

Then there are women artists, novelists, journalists, teachers, typists, musicians, actors, doctors and the exponents of the complicated flower arrangement and the tea ceremony.

The number of women clerks in banks and mercantile houses is on the increase. The Bank of Japan and the Hypothec Bank each employ over 120 women. While their salaries may only be from \$5 to \$15 per month, their lunches and work dresses are supplied by the bank and the workers participate in the semi-annual bonuses so popular in Japan's industrial and mercantile life. The telephone companies employ, as in this country, a number of women. Women typists, as a class, have by far the best positions, receiving as much as \$50 a month. In the case of the school teachers what they lose in large salaries they make up in the higher social recognition and greater respect accorded them. Some actresses command as much as \$150 a month but their surplus at the year's end is negligible,—the lure of fine clothes is ever present and too effective. Women doctors have sometimes had a practice which brought \$3,000 a year but such cases are few and far between, the majority serving in hospitals for \$25 to \$50 a month.—[From "Japan Society," May 31, 1917.]

A REPLACEMENT SUGGESTION

The problem of replacing the men who may be called to the national service is prominent in the public mind, particularly in view of the growing fear that the war may last longer than we at first supposed. The Bulletin of the League for Business Opportunities for Women notes the following suggestion by one of the employees of a New York banking house: He proposes that wherever practicable every man who is of military age, and so subject to future call, though not liable on the first draft, should begin at once to train "his nearest qualified female relative" for his work.

The plan has certain definite advantages. It follows the French method of placing the sister in her brother's position, the wife in her husband's. It turns to account the woman's natural interest and enthusiasm in her husband's work and her desire to make good in order to hold his place for him. It assures her of an income, and yet saves the firm from the double salary to absent employee and his substitute, which is might otherwise attempt to pay as a patriotic duty. It solves the problem of readjustment after the war, because the wife takes the place avowedly as a substitute and not as a competitor. Though she has every incentive to do her best and succeed in the position, she is nevertheless merely holding the place temporarily, and is perfectly willing, even anxious, to surrender it to her husband when he comes back.

Finally, it provides for her, in case he does not return, by training her to be self-supporting and supplying her with a position at one and the same time.

The measure of the success of such a plan is the intelligence and ability of the wife and the foresight and energy with which her husband takes up the subject of the preliminary training, and, it might be added, the persistence and patience of both. It rests upon the recognition now

of a crisis that may come six months or a year or even two years hence, and the prudence and determination to begin immediately to get ready for that crisis by a real preparedness.

WOMEN IN TECHNICAL ELECTRICITY

Recently, due to the lack of technically trained men, the British Westinghouse Electric and Manufacturing Company, Manchester, England, has been obliged to consider the possibilities of employing university trained women in technical positions. While making provision for the special training of such women, it was realized that there were many young women of marked ability in the company's employ who, with a short course of specially designed training, could be used most efficiently on more important work than that which they are now doing. Classes are now held to provide this instruction. Two main courses are provided. One, which is subdivided into two parallel courses each of five hours per week, is intended for women of good general education who will be employed as assistant engineers, senior draughtswomen, or in commercial work requiring more technical knowledge. The second course, a drawing office course, is intended for women tracers, and they are trained to be draughtswomen.

Promotion is one of the main objects aimed at in holding the classes for women. The company has recently put forward a scheme for the promotion of its able employees, and for transferring people with ability that may not be used to the full in their present capacity.

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(In the rate-case now on trial before the Master in Chancery involving the rates for gas charged by the San Francisco Gas & Electric Company, the author contended that the remuneration for management of public utilities, participation in general prosperity and allowance for hazard, that is to say what would ordinarily be classed as profit, might well be brought into some relation to the volume of business. In this article he shows this to be more logical than to attempt to bring these elements into relation to the capital invested or to value.—The Editor.)

MANAGEMENT, BUSINESS HAZARDS AND THE UNEARNED INCREMENT

All rate regulating authorities are devoting much thought and study to the establishment of a proper basis of calculation when the rates to be charged by public utilities are to be fixed.

The highest court has said that value must be the starting point and the attempt is therefore generally made to comply with this apparent requirement of the court. The result is the use of a rate-base conforming to "present value" or to something that may be called present value, even though in making value the rate-base it is occasionally found necessary to read new meanings into the word value. After this value has been ascertained in some fashion the owner of the utility is allowed to earn a return thereon, usually somewhat in excess of what would be a fair interest return on money for investment in enterprises of like character.

When there is included in the rate-base thus established an allowance for "going value," the interest return allowed and earned on this "going value," together with earnings to cover the excess of the return rate over the ordinary interest rate, is the owner's compensation for hazards and for management and may also cover some participation in the prosperity and increasing values of the property in the community which is served by the utility. If the allowance for hazards has been correctly estimated, the owner will in the long run get little or no advantage therefrom, because this allowance will be offset from time to time by losses or sacrifices of various kinds. The allowance for participation in the general prosperity is not always recognized as being due to the owner for the reason that a part thereof, under the prevailing system of using value as the basis of the calculation, makes its appearance in the increase of real estate values and in the increasing values resulting from the gradual but recognized rise in the price of materials and the rise in the wage scale. And yet every utility helps to create the general prosperity. It adds to the unearned increment of the vacant lot and unused field as well as to that of the lot or field whose owner is a rate-payer. Some share of this prosperity should go to the utility, even when its property items do not include appreciating real estate. But, even when the earnings cover fair allowances for hazard and for the unearned increment, the obligation of the public to the owner of the utility is not yet fully discharged. There should be proper compensation for management. It is not enough to allow the bare salaries of those who are entrusted with the management and operation. The owner is entitled to

something more. He has brought into being and has placed at the service of the community, an effective organization the stability and efficiency of which is guaranteed, as in the case of a corporation-owner, by the character, judgment and business experience of a board of directors selected by the stock holders. The existence of the corporation, the business ability of its directors resulting in the energetic control of its affairs, the cash contribution by stock holders, the successful operation of the enterprise, or, in the case of the new venture, the implied guarantee of success, affords the basis for making loans and extends the ability of the public to enjoy transportation facilities or electric service, or gas and water supplies that might otherwise long be out of reach by reason of the limited borrowing capacity and lack of business ability of municipal organizations. The owner should be fully compensated for the service rendered. The mere payment of salaries to those who are actively engaged in the management is not full compensation for this service. The compensation for management even though not usually specifically referred to or separated from what might be called broadly the profit allowance, makes its appearance as a part of the excess of earnings above the actual cost of money (interest with due regard to discounts and commissions) after allowing for operating expenses and replacement requirements.

That there should be something in the earnings as compensation for management can hardly be questioned. There will, however, be difficulty in bringing the same into a satisfactory relation to the rate-base. This is equally true of the allowance which should be made for the participation in the general prosperity and is true to a less extent of the hazard allowance. All of these elements which should be covered in the earnings are more closely related to the volume of business than to the capital invested in the enterprise or to any rate-base built up from "value."

It happens occasionally that a public utility concern does a large volume of business on a small investment. Some of the express companies belong in this class. The case may readily be conceived, of such a concern which rents its office facilities and operates under contract with railroad and steamship companies and which outside of its trucks and other vehicles for local delivery, has made no investment of any moment. It would be in vain in such a case to attempt a regulation of rates based solely upon a fair return upon the invested capital. The whole field must be brought into view. The volume of business transacted is, in such a case, equally as important an element for consideration as is a rate-base when a limit is to be set upon the earnings.

An express company, as here assumed, has no appreciating property. Its share in the unearned increment of the country should be brought into some relation to the amount of service which it renders, that is, to the volume of its business.

The compensation for management likewise is intimately related to and should be figured with the volume of business as the starting point.

It would, of course, be quite as feasible to start with the total cost of operation instead of with the gross annual receipts when determining what should be allowed for management and what should be allowed to cover participation in general prosperity, but the gross income as a basis has obvious advantages. Bookkeeping will be simplified and the control is more readily effected. The annual cost of operation will be more difficult to ascertain and will show greater relative fluctuations than the annual gross income, and for the same allowance in the earnings, the per cent of the annual gross income will be less than the per cent of the operating cost, thus resulting in greater stability of the percentage allowance when once fixed.

From the standpoint of the public, there can be but little question that the compensation for management should, as here suggested, be brought into fair relation to the volume of business instead of making its appearance in the interest allowance on an arbitrarily established or assumed "going value." No basis has yet been discovered for estimating "going value" except capitalization of net profits. When, therefore, "going value" deduced from the opinion of experts, supported chiefly by assumptions, as distinguished from cost of developing business, is included in a rate-base, the procedure must appear illogical to the rate-payer and will always remain subject to attack, both as to principle and amount. The alternative procedure which is now suggested but which is novel and is here perhaps for the first time brought to the attention of a court, should appeal to all concerned as logical and in accord with the common practice in ordinary business affairs of allowing commissions based on the magnitude of the involved transaction.

To summarize:—

No argument seems to be required to prove the owner's right to compensation for management.

This compensation can not be brought into any definite or satisfactory relation to what I believe should be designated as the natural rate-base, which is the legitimate investment, usually determined from cost of reproduction including an allowance for cost of developing business but without deduction of depreciation, because the amount of business bears no definite relation to the amount of capital invested.

If this compensation is brought into some relation to value (including in value the going value of the concern), then the reasoning will be in a circle and the proceeding will be illogical and absurd.

It will always be fair to both the owner and the rate-payer to let this compensation be brought into a proper relation to the gross income.

The owner's share in the general prosperity of the community, under the customary procedure of the rate regulating authorities, is recognized in those cases in which the utility plant includes property which is

appreciating in value. There may be some unearned increment, in addition thereto, concealed in the allowance for "going value" and in a rate of return in excess of the cost of borrowed money, but so long as one concern gets the unearned increment in large amount due to increasing values of real estate and other concerns apparently get none, the system will be at fault. The participation in general prosperity should, therefore, also be brought into relation to the volume of business and not to a rate-base.

The business hazard is contingent in part on the amount of capital which the owner has invested and in part on the cost of operation. The allowance for hazard if considered apart from obsolescence and from losses due to fortuitous events, which should ultimately fall on the public and not on the owner, will ordinarily be small and, if expressed in figures at all, can be readily brought into relation to the volume of business. It is not logical to bring it into relation to value which may be made up largely of intangibles. It is not logical either to bring it into definite relation to the natural rate-base. Hazard, too, therefore, had best be brought into some relation to the volume of business.

THE DETERIORATION OF WESTERN COAL IN STORAGE

A report on the deterioration in the heating value of coal during storage, covering a five-year period, has just been issued by the Bureau of Mines, Department of the Interior, as Bulletin 136, Horace C. Porter and F. K. Ovitiz being authors.

The tests show that the amount of deterioration of coal in heating value during storage has commonly been overestimated. Except for the subbituminous Wyoming coal, no loss was observed in outdoor weathering greater than 1.2 per cent in the first year, or 2.1 per cent in two years.

The tests with New River and Pittsburgh coal were made to determine the advantage to be gained by storing coal under water, and particularly under salt water. The results show that storage of New River coal under water effectively prevents deterioration of calorific value and that storage in the air under severe conditions causes only small deterioration, about one per cent in one year's exposure and about two per cent in two years.

The Sheridan, Wyoming, subbituminous coal, known also as "black lignite," is commonly supposed to deteriorate rapidly in storage, especially by "slacking" or crumbling of the lumps. Under the conditions of the tests this coal lost 3 to 5.5 per cent of its heat value in two and three-fourths years' storage, the greater part of this loss being in the first nine months. In general, the lumps became badly cracked, but retained their form sufficiently to permit ready access of air. However, they were weakened so that they broke up badly on handling. By the use of bins with air tight bottoms and sides and a protecting layer of fine slack on the surface, the deterioration of Sheridan coal in heat value can probably be kept below 3 per cent in one year and the physical deterioration can also be largely prevented in the under portions of the pile.

FUEL OIL AND STEAM ENGINEERING

(New patents that have been issued recently at Washington show that inventors are still at work with ever increasing success in an attempt to improve the burner or atomizer used in fuel oil furnace operation. In this article the authors first classify the various types of burners that have found their way into practical application and then a well-known type of each class is described in detail and the good and bad features of each design are called to the attention of the reader. The discussion closes with a statement of the various types of boilers and their particular uses in fuel oil practice.—The Editor.)

BURNER CLASSIFICATION IN FUEL OIL PRACTICE

BY ROBERT SIBLEY AND CHAS. H. DELANY

In 1902 and 1903 the U. S. Naval Fuel Oil Board made an exhaustive inquiry into burners of various types. In their report a classification of burners was set forth which comprehensively details the fundamentals of various types of burners known as the drooling, the atomizer, the chamber, the injector, and the projector types.

In the drooling type the burner allows the oil to drool from an upper opening down to a lower opening from which the steam is issuing. An atomizer burner allows the oil to drop directly on the steam. The chamber or inside mixer atomizes the oil within the burner after which it issues from an orifice of the desired form. An injector burner is designed primarily to operate without a pump as it is presumed that the oil will be sucked from the reservoir by the siphoning or injector-like action of the steam jet inside. In the projector burners the steam blows the oil from the tip of the burner.

Two other general classifications prevail depending upon the character of the flame emitted—namely, the fan tail and the rose. In the former type the burner produces a flat flame while in the latter a circular flame is sent forth.

The three principal types of burner that are encountered in central station practice are, however, known as the **inside mixer**, the **outside mixer**, and the **mechanical atomizer**.

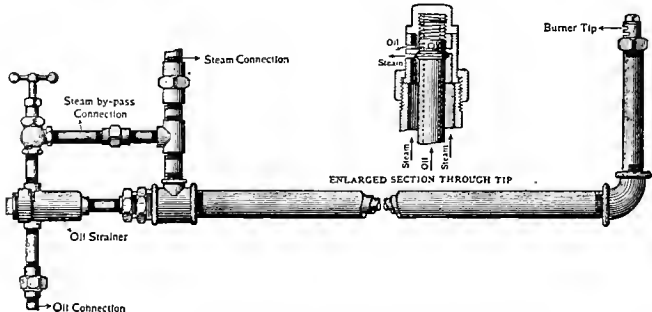
The Inside Mixer.—In burners of this class, the steam and oil come into contact, and the oil is atomized inside of the burner itself, and the mixture issues from the burner tip ready for combustion at once. The Hammel burner is of this type.

The accompanying cuts illustrate the construction of this burner. Oil enters at A, flows through D into the mixing and atomizing chamber C; steam enters at B, passes through F, E, and then through three small slots, G, H and I, into mixing chamber

C where it meets the oil, and as these small steam jets cut across the oil stream at an angle, the energy of the steam is utilized. The burner requires for its operation about 2 per cent of the steam generated by the boiler. The heavy hydrocarbons of the oil are atomized, the light hydrocarbons are vaporized, and the completed mixture issues from the burner and ignites like a gas flame. In normal service there is no tendency to carbonize, and the only way in which carbonizing can be caused is by turning off the steam and leaving the burner filled with oil instead of blowing it out before shutting down.

All oil is usually more or less gritty and will cause wear of some part of the burner. This is provided for in the Hammel burner—the removable plates K K can be quickly replaced.

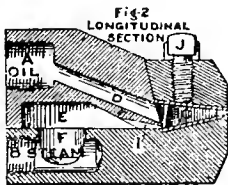
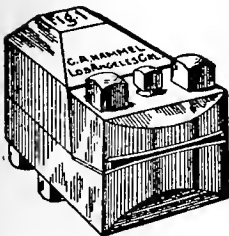
The Outside Mixer.—In the outside mixing class the steam flows through a narrow slot or horizontal



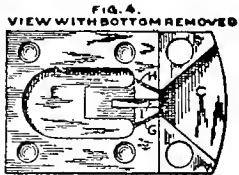
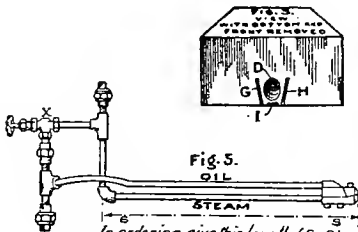
THE OUTSIDE MIXER TYPE OF BURNER

In this type of burner the steam flows through a narrow slot or horizontal row of small holes in the burner nozzle. The oil flows through a similar slot or hole above the steam orifice and is picked up by the steam outside of the burner and thus atomized. The Peabody burner which is shown in this illustration is a typical burner of this type.

row of small holes in the burner nozzle; the oil flows through a similar slot or hole above the steam orifice, and is picked up by the steam outside of the burner and atomization thus accomplished. The Peabody burner is typical of this class. It will be noted that the portions of the burner forming the orifice may be



- A Orifice for Oil Supply Pipe
- B Orifice for Steam Supply Pipe
- C Mixing or atomizing chamber
- D Oil Inlet Duct
- E Equalizing Steam Chamber
- F Steam Entrance
- G, H, I Steam Ducts
- J Set Screw holding Plate
- K Removable steel plates
- X By Pass or Blowout Valve

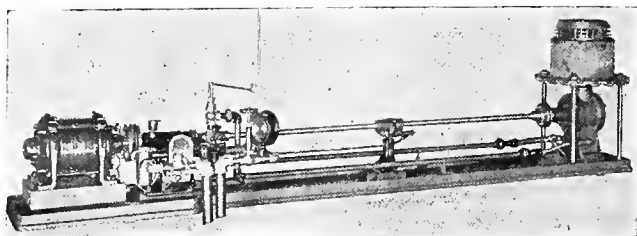


THE INSIDE MIXER TYPE OF BURNER

In burners of this type the steam and oil come into contact and the oil is atomized inside the burner itself. The mixture then issues from the burner tip ready for combustion. The Hammel burner shown in the illustration above is of this type.

readily replaced in case of wear or if it is desired to alter the form of the flame.

An Example of the Mechanical Atomizer.—As an illustration of one of the many interesting types of burners that produce atomization by the mechanical process, let us consider for the moment the rotary burner of the Fess System Company. The mechanism that accomplishes the atomization is operated by a small electric motor as shown of $\frac{1}{4}$ to $\frac{1}{3}$ h.p. The motor operates a rotary pump through a worm gear.

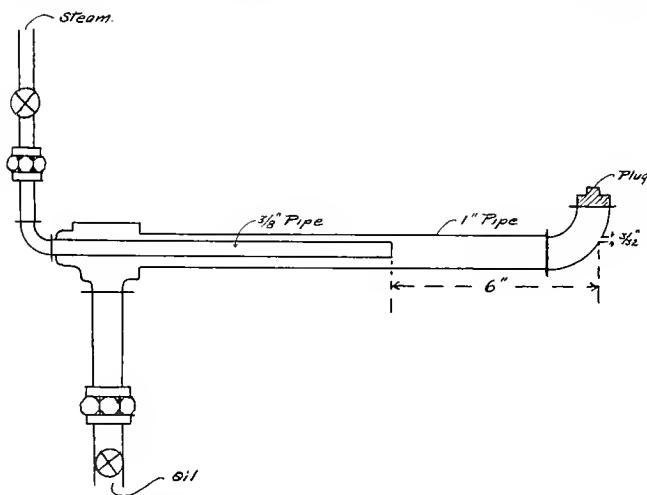


A MECHANICAL TYPE OF ATOMIZER

Many types of mechanical atomizer may be seen upon the market in which various physical laws are made use of to accomplish atomization. In the mechanism shown in the illustration, which is that of the Fess System Company, the burner is caused to rotate at a sufficient speed to thoroughly atomize the oil by centrifugal force. By the proper admission of air a smokeless flame is produced, equally distributed throughout the fire-box.

This pump brings the crude oil from the storage tank and applies it to the burner, which is placed in the center of the fire box. The burner rotates at a sufficient speed to thoroughly atomize the oil by centrifugal force and by the proper admission of air a smokeless flame is produced equally distributed throughout the fire box.

The Home-Made Type of Burner.—Patented oil burners are practically unknown in the oil fields. Every operator makes his own burner out of ordinary fittings. The construction varies somewhat depending upon the ideas of the maker and the quality of oil burned. The general principle of the burner is illustrated in the sketch. No oil pumps are used, the



THE HOMEMADE BURNER

This ingenious type of homemade burner is a product of the oil fields. The impact of the jet of steam which issues from the inner pipe produces a back pressure on the oil issuing from the annular space between the pipes, thus making the burner self-regulating to a great extent.

oil being supplied by gravity from a tank set from 6 to 10 feet above the ground.

An important peculiarity of the burner is that it is self-regulating to a great extent. The impact of the jet of steam issuing from the inner pipe produces

a back pressure on the oil issuing from the annular space between the pipes. If the steam valve is adjusted for good atomization any increase of the steam pressure will cause more steam to flow through the inner pipe. This will increase the back pressure at the tip and choke back the oil coming from the annular space, thus decreasing the fire.

If, on the other hand, the steam pressure drops, the back pressure at the tip is decreased, more oil will flow and the fire will be increased.

This type of burner is sensitive to variations in steam pressure. As the steam pressure goes up, the fire is cut down until a point is reached at which the fire becomes spasmodic or "bucks."

While this self regulating feature helps to maintain constant pressure on the boiler, it is not economical because as the steam pressure increases, thus diminishing the quantity of oil, the quantity of steam increases with the pressure. Thus, the less oil is burned the more steam is used for atomizing, which is just the opposite of what it should be.

Another peculiarity of the burner is that it will begin to atomize when the steam pressure is less than a pound above atmosphere. As soon as a sizzle is heard issuing from the steam pipe, the burner will make a fairly good fire.

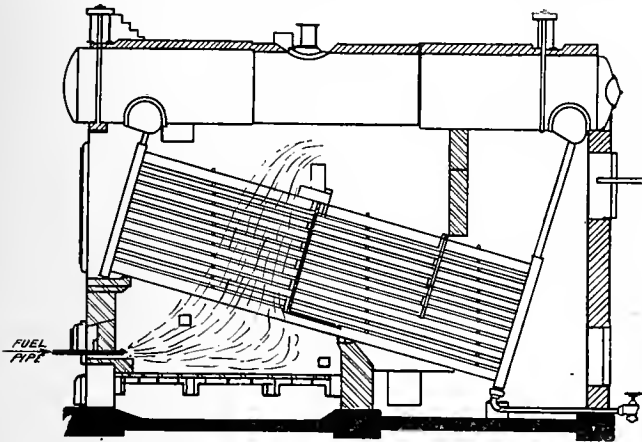
Quantity of Steam Required.—The regulation of the quantity of steam used for atomizing the oil is a matter of very great importance, as if more steam is used than is actually needed there is not only a waste of the excess quantity of steam but also there is a loss of the heat required to raise the temperature of this extra steam up to the temperature of the escaping gases. With careless operation the quantity of steam supplied to the burners sometimes amounts to as much as 5% of the total steam generated by the boiler, whereas with proper care in operating this quantity can be reduced below 1%. A simple way to adjust the quantity of steam supplied is to gradually close down on the steam valve to the burner until drops of oil fall on the furnace floor. The drops burn and scintillate and can be readily seen and this scintillation indicates that there is not sufficient steam to atomize the oil. As soon as this point is reached the steam valve should be opened just enough to stop the scintillating action. This method will insure sufficient steam being supplied but no more than necessary.

The quantity of steam supplied to the burner bears an important relation to the furnace arrangement and the air supply, as both the shape and character of the flame change when the quantity of steam is varied. With too much steam an intense white flame is produced which has a tendency to cause localization of heat on the brickwork or the tubes. With the proper amount of steam and correct air regulation a soft orange-colored flame is produced which fills out the furnace and has a good deal the appearance of a flame from a soft coal fire. This flame will sometimes appear smoky in the furnace but the smoke disappears before the gases reach the stack. It is, therefore, unnecessary to have an absolutely clear flame in the furnace.

It is not a difficult matter for an experienced man in charge of the boiler plant to properly adjust the

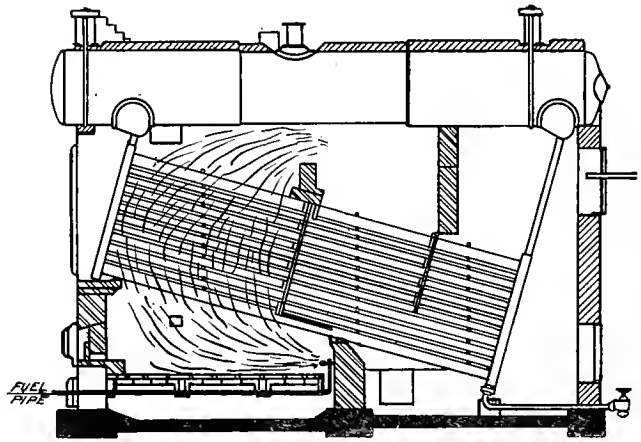
steam and oil valves so as to get the right amount of steam. It is often very difficult, however, to get the firemen to use sufficient care in making these adjust-

station work the oil should be heated up to about 180° Fahrenheit on the pressure side of the pumps, the pressure carried running from 40 to 60 lbs.



B. & W. BOILER WITH FRONT SHOT OIL BURNER

With this furnace arrangement the flame does not fill out the first pass, so the front end of the tubes do not do their share of the work.



B. & W. BOILER WITH BACK SHOT OIL BURNER

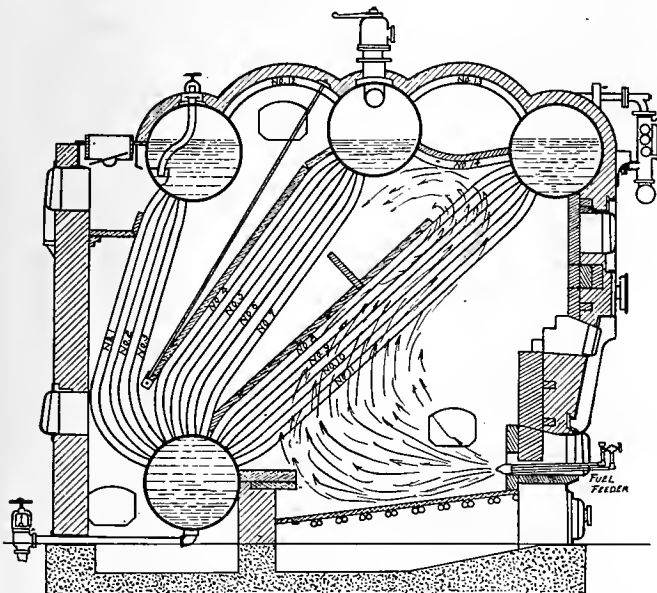
With this furnace arrangement the gases have ample volume in which to burn, and they distribute themselves over the entire first pass, resulting in efficient operation.

ments. A simple method of preventing too much steam being used for atomizing where boilers are operated at a fairly steady load is to provide a disc with a small hole in it, in the steam to burner line. This disc restricts the quantity of steam that can pass through to the burner. The size of the hole in the disc depends on the steam pressure used and on the capacity required from the boiler and must be determined by experiment. In a plant using 200 lb. steam pressure a hole 5/16 in. in diameter has been found large enough to supply all the atomizing steam required for a 600 h.p. boiler. A by-pass should be provided on the steam line so as to pass steam around the disc in case it is found necessary to force the boiler at any time above its normal capacity. By providing the by-pass with a valve having a rising stem it can be seen at a glance whether the valve is open or shut.

The quantity of steam required for atomizing depends largely on the temperature of the oil. The hotter the oil the less steam is required. In central

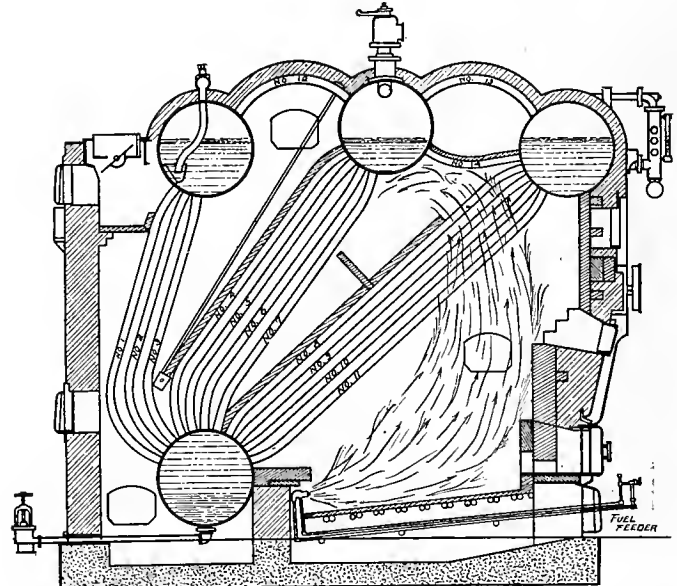
Number of Men Required for Operating Oil Fired Boilers.—The number of men required to operate boilers fired by oil is much less than the number required to operate a coal burning plant. In an oil burning central station a fireman can operate six or seven large boilers having three oil burners each, and in addition attend to the feeding of the boilers with water. In other words, a plant having 26 or 28 boilers would require only four firemen on a watch besides a man to look after the feed pumps, oil pumps and keep records of oil consumption, temperatures, etc.

Caution.—In operating oil fired boilers it is extremely important to avoid any accumulation of gas in the boiler setting, consequently, no oil should be allowed to get into the furnace unless there is a fire to ignite it and no more oil should be fed into the furnace than can be burned with the available quantity of air and atomizing steam. Any accumulation of gases inside the settings is liable to cause explosions which may result in serious damage.



STIRLING BOILER WITH FRONT SHOT OIL BURNER

With this furnace arrangement the tubes are swept by the hot gases for their full length, but this advantage is gained at the expense of furnace efficiency owing to the smaller volume available as combustion chamber.



STIRLING BOILER WITH BACK SHOT OIL BURNER

This furnace arrangement gives a splendid furnace with large volume, but the gases come in contact with only about one-third of the tubes in the front bank, so that the effectiveness of the heating surface is impaired.

WITH THE ELECTRICAL CONTRACTOR AND DEALER

THE HOME ELECTRICAL

BY CLOTILDE GRUNSKY

(It is much easier to sell an automobile to a man who knows how to run it and owns a garage. And so it is with things electrical. Numerous hints as to the way to run it and the type of garage to provide for the new percolator or iron—hints which may be passed on with profit to the customer—are to be obtained from this description of the model home electrical owned by D. E. Harris, vice-president of the Pacific States Electric Company.—The Editor.)

The great difficulty in selling electrical appliances is that the homes of the purchasers are not fitted up to receive them. The electric toaster which was received for a Christmas present is never used because the cord was so unsightly at the breakfast table—and it was such a nuisance to have to unscrew a bulb each time. So naturally enough the electric percolator is never bought and the electric chafing dish which looks so attractive is decided to be more nuisance than it is worth.

To the fact that people have not learned to use electrical conveniences is blamed the inadequacy of house wiring and the sparseness of base plugs and special conveniences—with much greater propriety

the charge might be reversed. To buy an electric vacuum cleaner for a home supplied only with gas would be like purchasing a buggy when you had no horse—to buy one when the house is incompletely wired and the machine can be used only at an inconvenience is very little better.

The opportunity of visiting a home in which every convenience of base plug and special fixture, of switch board and bracket has been worked out, would prove a revelation to any prospective owner of a 'house electrical'—it should prove a revelation to a contractor-dealer as well. For here he learns how he can best fit out a home so that a customer will profit to the greatest extent by the use of the electrical conveniences he has to sell. He can learn what suggestion to offer with the purchase for its better use, that the satisfied purchaser may return again. Such a home is that of D. E. Harris of the Pacific States Electric Company located on 17th Avenue, San Francisco.

An idea of the care with which the details of wiring have been planned can be obtained from the fact that in this 8-room house there are 14 base plugs and 31 switches.

The parlor is planned with special attention to the fixtures. Center bowl, side brackets and table reading lamp are all arranged with separate switches, so that the light may be varied at will to obtain a general illumination, or a concentration of the light where desired. The toning of the colors is a particular feature, the bowl and side lights shading from amber to cream and blending both in color and design with rug and wall paper. An ingenious arrangement here utilizes the porch light to illuminate the stained glass landscape over the piano, the window shining out with a soft radiance when the room is in semi-darkness.

The dining room is in silver grays and blues, the oxidized silver fixtures again toning in with the colors. A center fixture and side brackets provide a soft even light, adequate but unglaring. A special convenience is that of the base plug at the serving table which permits of the use of appliances there, wholly distinct from the center table. The dining table itself is provided with a floor plug,

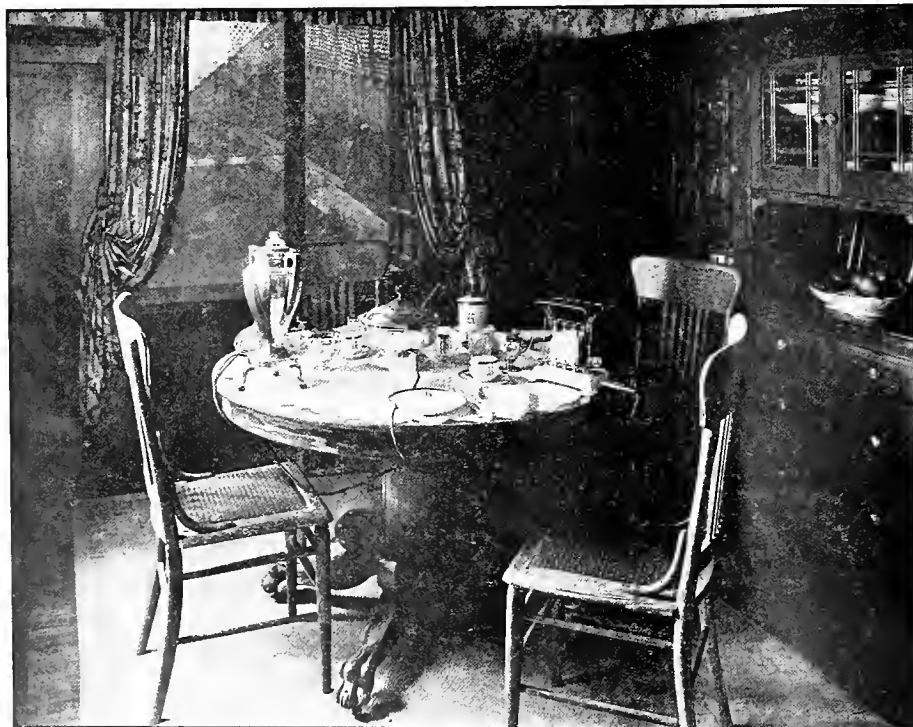


TABLE SERVICE FOR THE HOME ELECTRICAL

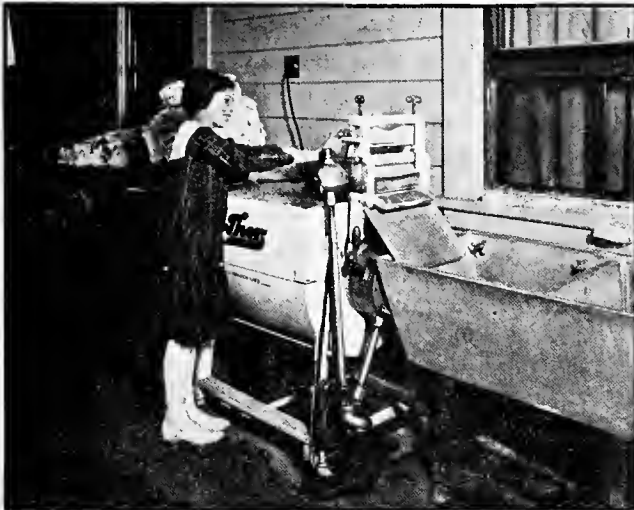
Note how the table sockets do away with the awkwardness of cords and overhead connections. The electric toaster, chafing dish and percolator are here a real convenience.

so arranged that it is quite flush with the floor and permits of the use of the room for dancing without inconvenience.

The breakfast room, however, is more thoroughly wired. It is not necessary here to clear the room in the same way as in the dining room—and a very ingenious scheme has been worked out. The table itself is wired and provided with three plugs on its under side, which make it possible to use toaster, chafing dish and percolator simultaneously. The whole arrangement is distinct from the lighting system and it is quite unnecessary to unscrew bulbs or scrape one's fingers on the shade in tightening the connection. The cords are entirely inconspicuous—and for the first time the electrical table cooking devices have become a convenience and not merely a rather entertaining plaything.

An artistic arrangement of glass sliding doors makes it possible to obtain a vista of the house, thus getting the full effect of the lighting scheme.

The special feature of the kitchen is the ironing board and iron. A small cupboard in the wall proves to be a concealed ironing board when unfolded. Above it is a shelf for the iron and stand. Immediately alongside of the board is the plug—not a screw socket but a plug which can be handled by a simple insertion. The Bryant switch is used here, the current being turned by a simple push button which lights at the same time a small pilot light. It is thus impossible to leave your iron on unwittingly—and quite unnecessary to feel of its surface at intervals with wet finger to see if you have pressed the correct button. An electric range is soon to be installed, thus completing the kitchen outfit.



The Electric Washing machine is so conveniently arranged that the housekeeper need only guide the articles from one operation to the other. A child can manage all the family wash.

The ground floor is fitted up as a den, with lights adjacent to tables where they are needed and conveniently situated in store closets. Here as elsewhere throughout the house, a special socket is provided for the vacuum cleaner.

A back room houses the Thor washing machine. This is conveniently arranged between a shelf on one side on which a basket can be placed and the tubs on the other. The clothes are put to soak on Sunday night, and placed in the washer before breakfast Monday morning. Attachments of hot and cold water



The pilot light switch plug makes it impossible to leave the iron burning by mistake.—Note how the plug is arranged to best advantage alongside the folding board.

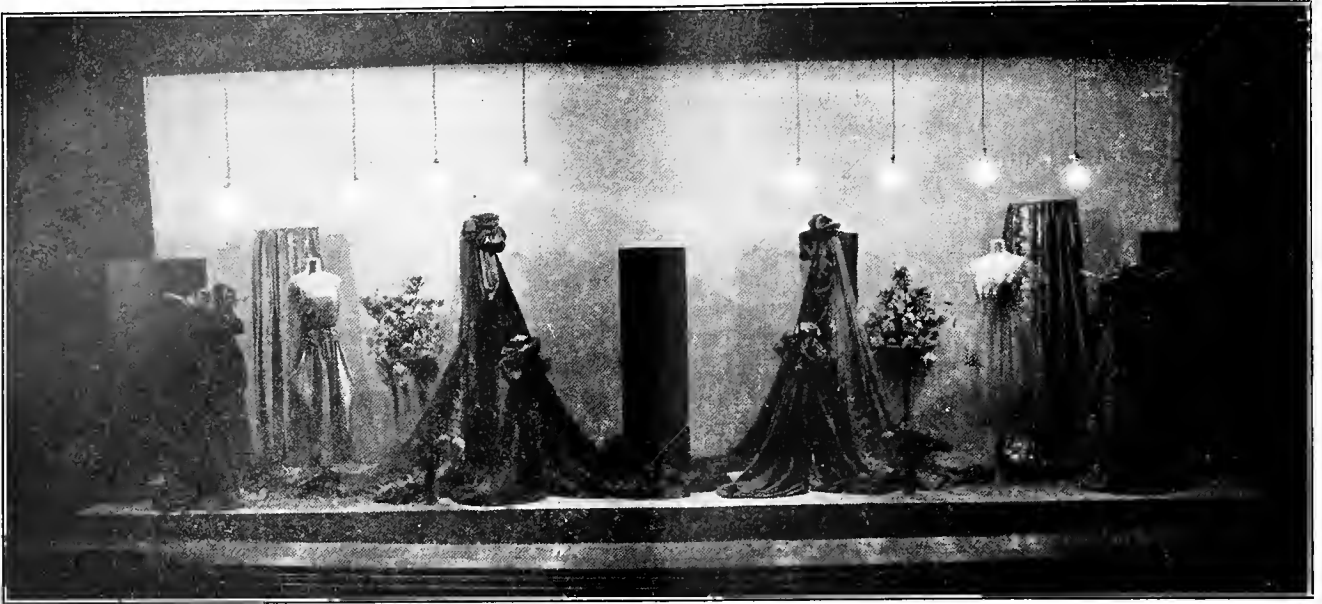
make it possible to regulate the temperature of the water used—and the machine is set in motion. By the time breakfast is over the clothes are washed—and the only duty remaining is to lift the pieces one by one to the electric wringer which is now turned on. This conveys the clothes to the rinse water, a new set is started in the washer, the lid closed and the articles again put through the wringer, now reversed, from the rinse water to the waiting basket. With the appliances thus conveniently and compactly arranged, it is possible for a child to handle them.

The upstairs floor is again a model of convenience. Brackets at the bureaus, center fixtures with separate switches, bedside reading lamps entirely distinct from the other lighting system, desk lamps and specially designed fixtures carry out the carefully planned scheme. A special portable fixture by the bedside is arranged somewhat on the order of an invalid's table, making it possible to swing the light over the bed to any point desired. Base plugs alongside the bed permit the use of bed pads or other conveniences for heating hot water, etc.—without the use of overhead fixture.

The bathroom has a center light which illuminates the room brightly and evenly without shadows. A special base plug here makes it possible to use an electric heater when desired.

Everywhere appliances and wiring schemes combine for beauty and convenience. There is no sense of cords or fixtures—merely of general well being and the acme of modern comfort.

Not one of these devices is strictly new, but the application has been studied out until it nears the point of perfection. And after all, it is the success of the ultimate installation rather than the mere appliance as demonstrated in a store which the purchaser is buying—it is that which the dealer must sell. The difference between electrical appliances as so used and the awkward fittings of the usual home is so marked that no one who has ever seen the example could fail to appreciate the value of ingenuity of wiring as a selling argument. The purchaser is not going to know these things for himself—he must be told them—and it becomes the duty of the contractor-dealer to know how to do it himself and to spread that information to his own great good.



Before

This merchant said his lighting was as good as any in town and he was going to leave it as it was—until he saw this photograph.

SELLING BY NIGHT

BY FRANK D. FAGAN

(The show window is the silent salesman of the merchant. How the central station can help the consumer to make proper use of his electrical lighting in store and home is pointed out in this interesting article which formed part of a paper given before the recent convention of the Northwest Electric Light & Power Association at Spokane. The author is western salesmanager of the Edison Lamp Works.—The Editor.)

There were at one time in the harbor of New York over 700 ships carrying whale oil into the city for lighting purposes. The oil dip was followed by the tallow candle. The coal oil lamp came next and in 1877 scientists from all over the world were working on the incandescent lamp.

It was about this time that Thomas A. Edison took up this work. He paid no attention to any other scientist and no one agreed with him. He worked for two years on the manufacture of the incandescent lamp, using over 6,000 pieces of material, grasses, herbs, roots, red hair—everything that he could get to use as filaments. Finally he made his first filament from a piece of sewing thread and, on October 21, 1879, Mr. Edison gave to the world the first incandescent lamp.

From this first lamp which required seven watts to produce a candle power, he has steadily improved his product through the bamboo filament, the cellulose project, the gem lamp to the tungsten lamp of today.

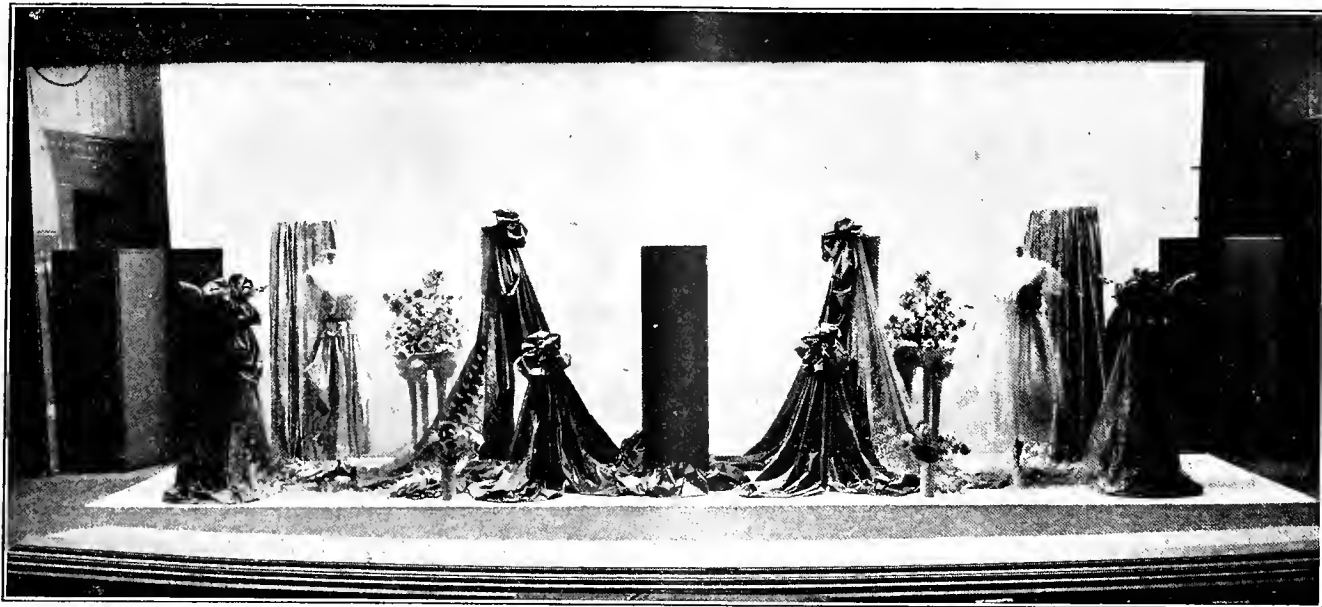
The change in lighting systems has revolutionized our homes and our business methods. Today efficient lighting of the streets means that the day is lengthened for the merchant. His potential customers do not hide away in their houses with the dark but pass up and down the streets in front of his establishment—to be made into actual purchasers by the displays in his electrically lighted show windows.

Where you have good street lighting you must have the very best of window lighting or you lose all the good effects of your windows. What is your window for? You have your window for one object

only, and that is to sell to your customers when the store is closed. In other words, it is your silent salesman. If that salesman is not properly groomed and properly arrayed, you cannot expect to sell any goods. Ten years ago you had to be satisfied with carbon lamps—today you can come so near to daylight that it is practically impossible for the consumer to distinguish between daylight and the incandescent light.

The greatest mistake made in lighting a show window is to place the light where it can be seen. You must conceal the light. Do not forget that the merchant is not selling electrical fixtures or lamps, he is trying to sell goods. It is true that human beings are just like flies, they are attracted by light; they are attracted by a fire, a light at any distance. But there is a limit to how close they can get, unless the effect is pleasing to the eye.

In the lighting of a store, your lamps should be placed so high that they give good distribution of light, but at no time are offensive to your customers. If your store is not brightly lighted they cannot see your goods or display. If you were running a fire sale, of course—and you really had a fire—and wanted to get rid of a lot of fire goods, I would say cut out about half of your lights, because you do not want the customers to see the goods. But that is different—I am talking about a place where you want them to see the goods. Do not spoil the goods and spoil the effects, however, by shooting the light in the eyes of your customers. The old method was to get the fixtures just as close to the floor as they would stand, and fill the fixture full of lamps. Now it is recognized



And After

The same window properly lighted. It seems incredible, but this is accomplished with the same amount of electricity.

that the best practice is to place the lamps just as high as possible, but properly spaced so as to distribute the light evenly over the goods that you have on display.

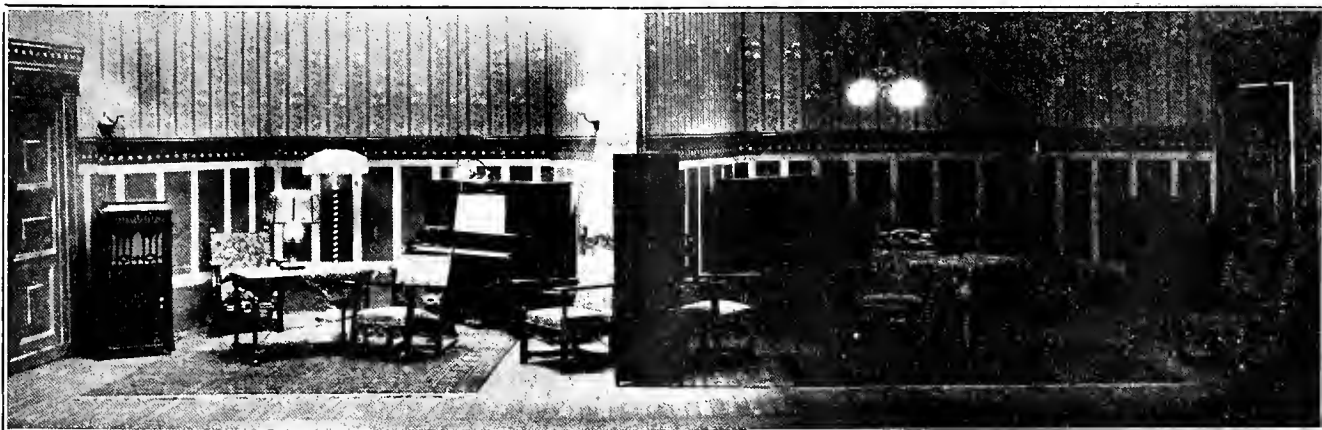
Some merchants try to light a green living room in a furniture store, or a red living room, with the same light that they try to light white goods. It cannot be done. You will never get results with red or green carpets or goods on display, unless you increase the light in your window. Another caution as to the use of blue lamps. This lighting is the nearest approach to daylight yet produced and colored goods are here seen for the first time in their natural hues—but a larger sized lamp must be used in every case than with the clear glass. It takes more current to give that daylight effect on account of the density of the glass.

Here is a very important thing for the hardware merchant or the man selling cut glass or diamonds: Don't put frosted lamps in your show case to light cut glass or diamonds. Have clear lamps. They need not be placed so that they will shine in the eyes of your

customers, but if you frost your globes or lamps, you spoil the sparkle both of the diamonds and of the cut glass.

The same principle applies in the home as in the store. The lamps are placed high so as not to be bleary and hard on the eye. One of the problems today in households is the question of what to do with dining room domes. When the people sit at the dining room table, they are trying to see the guests at the other end of the table—but usually they are looking directly into the dome fixture, with the light shining into their eyes. Now this can easily be corrected by the use of a piece of silk underneath the dome. By the use of cream colored silks—or almost any other color you like but white—the light is softly diffused and gives a very pleasing illumination. The glare which comes from any dome fixture is eliminated.

The lighting of the bedroom is another question on which everybody has their own ideas. In any case, however, the lady should have brackets at her dresser. For the general lighting of the room, the



Improved by Modern Methods

Imagine yourself trying to play the piano in this second room. The same amount of electricity is used in both of these rooms, but note how the portable fixtures bring the light to the points where it is to be used.

semi-indirect system is more popular than direct for bedrooms. If you want to read in bed, then, of course, you have your portable lamp for that purpose.

The lighting of a bathroom is simple. But do not place a bracket on one side of the bathroom merely and expect the husband to be in good humor, because he wants to shave both sides of his face. Either put it over the center of the mirror, or one on each side. You do not need any center light in the bathroom, you can use the brackets just as well and can turn them off by hand if you do not want to use all at once.

Every home has a certain style of furniture, a certain style of carpets, rugs, and draperies—all of which have to be taken into consideration in lighting. If you are going to have a green carpet or a red carpet, you will have to have 25 or 50 per cent more light than if you have a light brown carpet. If you are going to have cream walls, you have to use less light than if you have red walls or green and brown walls. People do not seem to realize that red, green and black carpets and walls make all the difference in the world in the lighting of the home.

The principal thing to bear in mind in the lighting of the home is that you want light at any particular spot in the room when you want to use that particular spot, whether it is the piano, or the library table, or the phonograph, or the chair where you sit and read. You need not light up the entire room. You can arrange separate portables. If you prefer to have the entire room lighted so that you can see just as well in one corner as another, there are, of course, other ways of handling the problem.

The semi-indirect, or bowl fixture secures a general distribution of light all over the room, using the ceiling as a reflector. With this system you have a very flat picture—with practically no sign of a shadow.

The system which I consider really the very best, however, is not as much used today as I think it will be within the next few years. By removing the center light altogether and using brackets and portables the easiest and most logical system of lighting can be achieved, one that you can control. You can clear out the room, take every fixture out and still have your room lighted up. If you wish to use a light at the reading table, or one over in the corner or at the piano, you can do that without any difficulty and without using all the fixtures in the room. This system requires in this case the same amount of electricity as this one with the carbon lamps. That may seem a bit far-fetched, looking at the two rooms, but it is absolutely true.

WIRING FEATURES OF THE PORTLAND AUDITORIUM

BY F. D. WEBER

Services

On the sub-basement level a reinforced concrete transformer vault has been constructed, cut off from the balance of the building by a standard fire door and ventilated to the outside atmosphere.

In this vault two banks of oil insulated, air cooled transformers are located, which furnish 3-wire single phase, 115-230 volt service for the general lighting system and 3-wire, 3-phase, 220-volt service for power.



THE NEW PORTLAND AUDITORIUM

The contractor must watch each new achievement of wiring to keep his methods and equipment up to date.

Also, a 3-wire, 110-220-volt direct current service is brought through this vault for supplying some of the arc pockets on the stage, the motion picture booth and receptacles.

Main Service Switchboard

The main service switchboard is located in a separate room which is adjacent to the transformer vault. The only feature out of the ordinary in this board is the use of the automatic emergency switch in the exit light service. Under normal conditions this switch is held in a position so that the service for the emergency lights is taken from the main one-phase lighting service ahead of the main circuit breaker, but if something should interrupt this main service, an electric release causes this switch to operate and automatically cut in another service from the other public service utility which supplies power to the building.

Hinged footlights were installed so that they could be closed flush with the stage, but they are not a success and will be changed. The dressing rooms have a curling iron outlet in each, placed two on a circuit. The lights in all the dressing rooms are protected with heavy wire cages.

The Main Exhibition Hall

In order to avoid the unsightly appearance of temporary wiring which must be done when land shows, automobile shows, etc., occupy this hall, a special gridiron system of conduit and cast iron floor boxes was installed in the basement floor.

The boxes are 16 x 16 x 6 inches, the lids being secured in place by brass screws and steam packing used to make them waterproof. The cover is ribbed and heavy enough for trucks to pass over. No wire is pulled in these raceways.

Also in the ceiling of this hall 6 cabinets have been located for use with temporary wiring in the halls above and in this hall. No wire is pulled in these cabinets.

The conduits from the raceways in the floor and ceiling terminate in the gutters of these cabinets and the gutters are provided with hinged doors so that temporary connections can easily be made. Several extra switches are provided in these panels to be used in case of emergency.

CO-OPERATION IN THE ELECTRICAL INDUSTRY

BY O. B. COLDWELL

(The contractor, dealer and central station find a common interest in increasing electrical business, the moral being that it is only as they help each other that they help themselves. The author, who is superintendent of the Portland Railway, Light and Power Company, has long stood for co-operation in the electrical industry. An article by him covering another phase of this subject appeared in the Journal of Electricity for October 1, 1917.—The Editor.)

This plan is being worked out satisfactorily in some Pacific Coast cities, and provides a direct or concrete incentive for the dealer to assist in boosting the electric range.

It seems to be most satisfactory to the prospect to be quoted a price on the range installed and ready for use, thus avoiding for them the confusion and complications of getting costs on the wiring up of the range. In other words, the installation cost or an average of such costs, is included in the quotation on the range, the central station absorbing the actual cost of the installation. This wiring job of installing the range is, therefore, under the control of the central station and should, wherever possible, be turned over to some responsible wiring contractor by the central station, as such work is distinctly in the field of the contractor and as long as his charge for the work is within reason and the quality of work satisfactory, he is entitled to the job.

This idea of quoting an installed price might also well be applied to water and air heaters and other similar devices where special wiring is required.

An important field for co-operative effort on the part of contractor and central station lies in the wiring of new buildings. The inclusion of special circuits for the larger heating and cooking devices, convenience outlets, baseboard and floor plugs at suitable locations, convenience lighting outlets, etc., adds comparatively little to the cost of a new building and the joint efforts of the contractor and central station should influence the architect to include such items in his wiring specifications. A systematic follow-up system on the contemplated construction of all new buildings should be carried out for this purpose. Intelligent and tactful co-operation along this line is usually welcomed by the architect and the results of such practice are obviously to the direct advantage of both contractor and central station, to say nothing of the consumer.

Mr. A. S. Moody of the General Electric Company covers this idea in the following:

"It should be the aim of both the contractor and central station to work with each other on general supplies and wiring. They should, of course, be boosting the electrical business and the only way to succeed in that is to boost each other's business. For example, every residence should have a number of baseboard outlets. They are a matter of permanent convenience to the householder acquired at little additional expense when the house is wired, but difficult of installation after the house is completed. Their installation undoubtedly means additional revenue to the central station by promoting the use of household utensils, vacuum cleaners, etc. Their installation also means additional work for the electrical contractor and he is anxious to put them in. As a matter of fact, however, the majority of residences have no baseboard outlets and a very small percentage have

them, except the one in the kitchen for a flatiron. The reason the contractor cannot put them in every house, as he would like to do, is because of competition with his fellow contractor who will quote lower figures leaving them out. The remedy, I believe, is co-operation between contractor and central station with the architect in getting such conveniences specified in the wiring specifications. To do this logically the architect himself should first be convinced of their usefulness and necessity, so that he will feel his work is incomplete if they are not specified."

Mr. F. C. Green, a prominent Portland contractor and dealer, refers to this point as follows:

"The contractor dealer's object should be to serve, and his service should be prompt, intelligent and reasonable in price. The contractor often acts as the medium through which a large portion of the public obtain their knowledge of electrical affairs. The architect very frequently relies upon the contractor for detail in his electrical specification and many of the newer devices, although personally advertised by the manufacturer representatives, are not favorably considered until recommended by the contractor."

It is of importance that the wiring specifications specifically include the desired capacity and outlets. Loosely drawn wiring specifications offer too much of a temptation to the over-zealous contractor to "shave" on material and labor to the disadvantage of all other parties concerned, and in the long run to his own disadvantage as well.

In the wiring of old buildings, the combined efforts of the contractor and central station must usually be directed toward the consumer himself, especially in the case of residence work.

On the Pacific Coast the field for the wiring of old buildings is much more limited than in the East, but there are even here a surprisingly large number of prospects in this class.

With the proper degree of effort expended by the contractors in working up business along these lines, there is no occasion for the central station to do this class of work. It can, however, and most central stations do, take an active part in the solicitation of this business by means of wiring campaigns, offers of installment propositions, premiums, etc., the contracts for the wiring being turned over to responsible contractors on some flat rate or percentage basis previously agreed upon, the central station usually carrying the financial burden of the installment form of payment, the contractor receiving full payment from the central station upon the satisfactory completion of the work.

The harmonious operation of this plan involves the highest degree of co-operation between contractors and central stations. That it can and has been successfully carried out is demonstrated by the experience of a number of companies here on the Pacific Coast, including that of the company which I represent. It has been our consistent policy for a num-

ber of years to leave the wiring of new and old buildings, including range wiring, to the contractor, not only in Portland but in the smaller cities and towns and rural communities served by our company. We have, however, demanded from the contractors fair treatment for ourselves and our consumers in the form of good workmanship, reasonable prices and proper observance of the company's wiring requirements as to service entrance meter loops, etc. With few exceptions, the contractors have satisfactorily met these conditions and as long as they continue to do so we are well satisfied to continue our present policy of full co-operation with them.

Another field for effective joint effort by contractor and central station exists in the assistance of the architect and consumer in the proper layout and selection of the lighting equipment in store, shop and home. Up to a very few years ago, that phase of the industry now known as "illuminating engineering" was almost completely neglected. Remarkable advancement has recently been made along this line by central stations and architects, and in some cases by dealers, particularly those specializing in electric and gas lighting fixtures. There still remains, however, a large number of contractors and dealers who have given this subject very little earnest thought. Most of the larger central stations now have on their staff an illuminating engineer who is more than willing to assist contractors in their problems of this kind. In view of the availability of this service, as well as that now furnished by the manufacturers of lighting equipment, and in view of the dealers' and contractors' exceptional opportunities to influence the design of lighting installations, especially in remodeled stores, there is small excuse for a continuation of the indifferent attitude above referred to. The sale and installation of modern lighting fixtures and lamps involves not merely a merchandising transaction but also the sale of a service in the form of intelligent advice and recommendations in the selection, location and operation of lighting equipment. On this point, Mr. S. M. Kennedy of the Southern California Edison Company comments as follows:

"There should be active co-operation existing in the larger cities, between the electrical contractors and dealers and the central station. This can be brought about to a considerable degree through the closer contact that membership in the Northwest Association, for instance, permits, and the friendships, discussion and policies leading out of it."

"The central station should have a definite mark in mind, below which the sales of apparatus and appliances should not be permitted to fall, and this bogey should be based on kilowatts connected rather than number of appliances sold. The mark should be sufficiently high to require the efforts of both the central station sales force and the contractors and dealers to reach it. The central station's efforts should be confined to load building rather than merchandising, at least to the extent of selling moderately priced appliances consuming 500 watts or over, selling around \$5 to \$7. Inquiries for washing machines, vacuum cleaners and articles selling at high prices, carrying a good merchandising profit with small consumption should be turned over to the dealers."

"The central station should maintain a force of house-to-house salesmen to create and stimulate demand. Also lend advertising aid. Send dealers' folders out with bills. Refer to contractors' inquiries for wiring and pursue a live-and-let-live policy, lending active co-operation, at the same time leading the way and not turning over altogether to others the vital matter of load building. Practically all of the work that the contractor does and all of the sales that the dealer makes is to the benefit of the central station and they should be offered every encouragement, not, however, to the extent of turning the entire load building business over to them. They are in a sense auxiliary, or at least going through an educational process from which they may in time graduate as full fledged load builders, capable of taking this responsibility off of the central station's shoulders. But that is only a dream as yet, and it is a long stretch from the kindergarten and primary to the college graduation. During this period every needed help should be supplied and those who do not know how to earn their way through school should be guided and assisted."

In the case of power installations, similar co-operation should exist between the dealer and contractor and the industrial engineering department of the central station.

One more subject presents itself in this discussion, that is the matter of advertising. Thousands of dollars are being spent each year by manufacturers of electrical appliances, in advertising campaigns in national periodicals and in attractive catalogues, folders, etc., covering almost every possible phase of the advertising game.

No small amount of money is also being expended by central stations, dealers and contractors in local advertising.

The point I want to bring to your attention here is: has this local advertising been correlated and co-ordinated to the best advantage and has it always been timed and designed to "tie in" with the national advertising campaigns of the manufacturers? Are we properly co-operating with the advertising efforts of the manufacturer and are we boosting the game as we should by proper co-operation in our own local advertising? Why not a few more of these "Electrical Pages" in our local papers, participated in jointly by dealers, contractors and central stations during Electrical Week last December? This subject is well worthy of the organized thought and action of associations such as we have here.

As I stated at the beginning of this paper, the title presented to me for discussion is one which is not susceptible to absolutely infinite and specific treatment. The personnel of dealers, contractors and central station representatives is largely a factor in the shaping of the co-operative relations between these two elements of the industry. I have, therefore, in discussing some of the more specific details of co-operative effort, been obliged to assume the existence of satisfactory local conditions as a basis for the plans discussed. I trust that the points here brought out, together with their later discussion, will assist, in at least some small way, in furthering the amicable relations which for the most part now exist between the electrical contractor and dealer and the central station.

NEW BUSINESS BUILDING METHODS

BY A. H. HALLORAN

(Too much emphasis cannot be placed on the necessity for the electrical contractor's understanding what constitutes overhead expense and what an important part it plays in his business success. Hence this article should appeal not only to the contractor-dealer but also to those most interested in his welfare, the jobber and the central station.—The Editor.)

THE DANGER OF UNDERRATING OVERHEAD EXPENSE

Nine-tenths of the electrical contractor's troubles are due to underrating something. He underrates the cost of labor and material in estimating a job. He underrates the Underwriters' requirements when the job is inspected. But above all else, he underrates the importance of overhead expense as an element in his business success. He forgets because he doesn't think it worth while to remember. Edward N. Hurley has said that a lack of understanding and appreciation of overhead is responsible for most business failures.

The overhead expense of any business is all money paid out which is not directly chargeable to any job or sale. Hence it is frequently known as indirect expense. It includes such a wide range of costs that the due proportion chargeable to each job or sale is figured as a percentage. This percentage is the average ratio of operating expenses to net sales.

If a contractor-dealer did a business of \$22,500 during 1916 and his books showed that he had made \$2500 over and above all expenses, including \$14,000 paid out for labor, material and other items which had been directly charged to each job or sale his overhead expense for the year would have been \$22,500—2500—14,000=\$6000, or 26⅔ per cent, i. e. the ratio of \$6000 operating expenses to \$22,500 net sales was 26⅔ per cent overhead.

If his overhead expenses during 1917 are the same as they were during 1916 his contract estimates or the selling price of his goods should include not only his cost of labor and material, as well as his profit, but also the 26⅔ per cent overhead. If his labor and material cost were 60 per cent of the 100 per cent selling price, his overhead 26⅔ per cent, his profit would have been 13⅓ per cent. The method of figuring these matters was fully explained by the author in the Oct. 15, 1917 issue of this journal.

A contractor-dealer's overhead consists of four divisions,—general overhead, office overhead, shop overhead and selling expense. Each of these is subdivided into detailed items as shown in the form on the next page.

It will be noted that this list is sufficient to care for the needs of a concern doing a large business. Smaller concerns may omit some items or where one person does the work of several the salary should be divided in accordance with the amount of time spent on each kind of work. Too much emphasis cannot be placed upon the necessity for carefully considering each item.

The owner's salary, particularly, should be allowed for independently of the profit that may be

made. Salary is not profit, for profit does not exist until a job has been finished, charged and paid for. A working owner is entitled to at least a journeyman's wage.

Rent should be charged against a business even though the proprietor owns his place of business. This charge should be the same as could be obtained by renting the place to some one else.

Public utilities, light, heat, power and water, are a necessary part of the overhead. Every electric shop should be lighted during the evening to call attention to window and store displays. Even if the store is not kept open at night do not forget the many evenings you spend at home figuring estimates or making out bills.

Insurance, taxes and license fees are purely a business and not a personal matter. Many big concerns insure against the death of their head men just as they insure against fire.

Losses and depreciation should not be overlooked. Bad accounts are occasionally unavoidable, you are bound to lose money on some contracts, market fluctuations cannot always be foreseen, and depreciation is inevitable. Due allowance should be made for each on the basis of your past records.

Delivery costs are especially liable to be overlooked. If you drive your own horse or automobile, the next time that you get up at five o'clock in the morning to do a hostler's work or tinker with your machine remember that you are working nearly 70 hours instead of 48 hours a week and employing a \$5 a day man to do a \$10 a week boy's work.

Strikes and time lost by men on jobs are a contingency that should be regularly provided for. The experience of successful men demonstrates that three per cent is none too much to allow for this possibility. Even if you get by this year you may be hit for six per cent next year.

Interest on working capital and investment, particularly, should not be forgotten. Figure at least as much as the savings bank would allow for the same money you have invested in stock and equipment.

Bookkeeping and stenographic work is a legitimate overhead expense. If your wife or family helps out on this work pay them at least what you would pay some one else. It is enough to sacrifice your own life for your business without sacrificing your family as well.

Finally, don't forget that it is the little things that count. A large number of apparently insignificant items unaccounted for may make all the difference between profit and loss. Don't underrate or overlook any item in your overhead.

FORM FOR FIGURING OVERHEAD EXPENSE

General Overhead Expense

Salaries	
Officers	
General Manager	
Insurance Premiums	
Fire	
Stock Supplies	
Furniture	
Tools and Instruments	
Buildings	
Life and Accident	
Lives of owners or partners	
Liability	
Employees	
Bonds, Surety	
Bookkeeper	
Cashier	
Collector	
Taxes	
Federal Corporation	
State Corporation	
Income Tax	
Real Property	
Personal Property	
Licenses	
Interest	
Interest on Investment	
Interest on Commercial Paper	
Interest on Loans	
Losses and Depreciation	
Bad accounts	
Losses on contracts	
Depreciation on tools and stock supplies	
Losses by theft, fire and law suits	
Breakage	
Strikes and time lost	
Market fluctuations	
Miscellaneous	
Charitable Donations	
Christmas Presents	
Cost of organization, charter, etc.	
Books and magazines	
Societies and Conventions	
Association Dues	
Convention Expenses	

Selling Overhead Expense

Salaries and Commissions	
Salesmen	
Solicitors	
Estimators	
Draughtsmen	
Advertising	
Daily papers	
Programs	
Directories	
Signs	
Printing	
Photographs	
Petty Expense	
Entertainment	
Stationery	

Office Overhead Expense

Rent	
Office	
Janitor Service	
Light, heat and water	
Telephone	
Local Rental	
Long distance tolls	
Telegrams	
Salaries	
Office manager	
Bookkeeper, stenographer	
Clerk and office boy	
Auditor	
Maintenance and Repairs	
Furniture repairs	
Typewriter and adding machine repairs	
Cleaning rugs, papering, painting, etc.	
Cost of Collections	
Salary of collector	
Legal expenses	
Mechanics' liens	
Postage, carfare, etc.	
Sundry Expense	
Stationery, including ink, paper, time slips, books of record, supplies	
Expressage for office not chargeable to stock or work in progress	
Incidentals	
Postage, towels, drinking water, etc.	

Shop Expense

Shop Costs	
Superintendent's salary	
Employees,—non-productive wages	
Rent	
Heat, light, power	
Stockroom	
Stock-keeper's salary	
Rent	
Light and heat	
Cleaning and petty repairs	
Delivery Department	
Delivery boys	
Automobile or horse and wagon	
Cost of upkeep	
Depreciation	
Taxes, repairs	
Employees' salaries	
Carfare	

SUGGESTIONS FOR CONTRACTOR AND DEALER

DEPARTMENT CONDUCTED BY GEORGE A. SCHNEIDER

(In order to protect both men and motors without at the same time making it necessary to shut down the plant every time there is a short circuit, the type of controlling and protecting devices to use is a matter which must be carefully weighed. A review of Western methods and an original suggestion or two will prove helpful in considering this problem.—The Editor.)

NOTES ON UNDER-VOLTAGE RELEASE ATTACHMENT FOR CONTROLLING AND PROTECTIVE DEVICES

Since the publication of the National Electrical Safety Code by the United States Bureau of Standards there has been a steadily increasing demand for motor starting, controlling and protective devices, which are equipped with under-voltage release features. This demand results from two causes; first, because in several states this code has been adopted in part by the industrial accident commission and under certain conditions the use of devices so equipped is mandatory; second, because the value of these features as a "Safety First" measure is now more generally recognized and they are being more largely adopted in many installations even though their use is not required by any particular law.

In the National Safety Code, the rule indicating when devices equipped with under-voltage features must be provided will be found in paragraph (c) of section 340. The rule reads as follows:

"Manually controlled starters for motors shall be so designed and circuits so arranged that they return automatically to the 'off' or starting position upon failure of the energy supply, except where the motors and their starting devices are, during operation, under supervision of qualified persons and equivalent protection is otherwise provided."

In the California Electrical Utilization Safety Orders a similar requirement will be found in paragraph (d) of Order 747. The intent of this order is the same as the corresponding rule in the National Code although the wording is slightly different.

These particular rules will require very little change in the common types of direct current starters and regulators as it has been standard practice for a number of years to equip these devices with the under-voltage attachments. This statement may also be applied to starting compensators for alternating current motors since all of the later designs have similar attachments. However there are many of these devices, such as drum type starters or controllers and automatic starters for both direct and alternating current motors and many starting switches for alternating current motors of those sizes which do not require a starting compensator that do not give the protection required by these rules. On this account there are many re-designed or new lines of control devices being developed which not only comply with these particular rules but include many other safety features as recommended in the National Code.

As is to be expected a great many questions about these rules and the method of making installations to comply with them are brought up, especially in California where the safety orders have been effective since January first of this year. The various questions which have come to the writer's attention most

often are outlined in the following paragraphs. They apply in particular to alternating current apparatus and for this reason our discussion of them will be mostly concerning alternating current motors, controlling devices and systems. From this our readers should be able to understand the requirements for equivalent direct-current installations.

- (a) What is the difference between a no-voltage, a low-voltage and an under-voltage release? What is the difference between low-voltage release and low-voltage protection?
- (b) What is the purpose of the low-voltage feature—to protect the operator or the motor, or both?
- (c) How many low-voltage coils should be provided for polyphase apparatus—one only or one for each phase?

Let us now take up these questions in the order they are stated. The definitions of the terms low-voltage release and low-voltage protection as adopted by the Electric Power Club are:

"Low-voltage release. The effect of a device operative on the reduction or failure of voltage to cause the interruption of power to the main circuit but not preventing the re-establishment of the main circuit on return of voltage.

"Low-voltage protection. The effect of a device operative on the reduction or failure of voltage to cause and maintain the interruption of power to the main circuit."

From these definitions it should be clear that low-voltage release provides for the return of a device to the off position in case of reduction or failure of voltage but allows the device to again operate upon return of voltage. A good example is a contactor or self-starter controlled by a float switch. Such a device would automatically stop and start a motor as the voltage was removed from or returned to the line.

Conversely, low-voltage protection provides for the return of the device to the off position upon failure or reduction of voltage, but will prevent the device from automatically operating upon return of voltage. The ordinary starting compensator with low-voltage coil and spring return switch works in this way and is a good example of this action. Automatic starters can be arranged to give low-voltage protection by providing one or more push button stations, each having a starting and a stopping button so connected that the device will start only from the starting button.

The terms no-voltage, low-voltage and under-voltage are commonly used interchangeably and mean one and the same thing. Some prefer one term; some another. It is noticeable that one of the large electrical manufacturers recently adopted the term under-voltage in preference to the others. This is in contrast to over-voltage and corresponds to the terms under-load and overload. The term under-voltage is preferred by the writer as it seems to be more logical and descriptive and will be used in the remaining part of this article. It has not been used exclusively in the questions listed because the other terms seem to more clearly express the questions as commonly stated.

This statement applies so far to the discussion of the questions.

Considered from the standpoint of protection to the electrical equipment, the purpose of the under-voltage protective feature is not so much to protect the individual motor as it is to relieve the power system of having to pick up the entire starting load of a number of motors following some emergency condition which caused a failure of voltage on the system. If it is remembered that the momentary starting current of the average 60 cycle squirrel-cage polyphase motor started at full line voltage is about 7 times full load current it will be appreciated that a large number of induction motors not having starting compensators equipped to give under-voltage protection might under certain conditions cause serious delay in again restoring service after each shut down.

However, this statement should not be taken to mean that starting compensators with under-voltage features are always most desirable. There are certain conditions under which better service can be given with compensators or starting devices having proper overload protection only. Consider a large power system with a number of sub-stations and a number of feeders originating in each sub-station. A severe short circuit on one of the feeders may have practically the same effect as a complete interruption, allowing starters equipped with instantaneous under-voltage features to operate and thereby shut down the motors. With the feeder system properly sectionalized and equipped with the right kind of protective devices a short circuit would ordinarily be cleared within a few seconds, at least very often before an induction motor would drop its load due to the momentary reduction in voltage. Under such conditions it is better practice to have the under-voltage attachments equipped with a short time limit or eliminate them entirely and depend upon an overload device for the necessary protection.

This scheme of protecting alternating current motors is extensively used by one of the large power companies in the West. This company has several interconnected power houses and a large number of sub-stations. They furnish power for several thousand motor-driven irrigating plants, most of which operate without any attendant. It is obvious that it would not be desirable to have each one of these plants shut down every time there was a short-circuit or other disturbance which would cause a momentary drop in voltage. To guard against these shut downs this particular company requires that compensators except under certain conditions shall not have under-voltage attachments. Their rule covering this particular requirement reads about as follows:

"Three-phase motors of 7.5 h.p. and over shall be provided with oil circuit breakers having two adjustable inverse time-limit overload trip coils. These circuit breakers are to be connected with the starting compensator so they will not be cut into the motor circuit until the compensator handle is thrown into the running position. Fuses shall be used on the starting side up to 30 h.p. inclusive on 220 volts and to 50 h.p. on 440 volts. No under-voltage feature is to be installed on the starter or circuit breaker. The above type of circuit breaker, however, is not required on motor installations where the customer maintains constant operating attendance so that in case of emergency all switching and starting devices can be immediately attended to so as to prevent damage to apparatus."

At this point it is well to note carefully that the

under-voltage attachments when used with three-phase (or two-phase) induction motors cannot be depended upon to operate except upon reduction or failure of voltage in all three phases of the circuit supplying the motor. They will not protect against reduction or failure in voltage in a single leg or phase of a three-phase circuit and will therefore not give protection against single-phase operation of the motor. A three-phase induction motor will run single-phase after having been brought up to speed and by reason of its transformer action will at the same time supply sufficient voltage through its windings to hold in the under-voltage attachment even though this might be connected to one side of the open-circuited phase and receive no voltage supply direct from the main circuit. This being the case, a single under-voltage attachment, that is, a single-coil device connected across one phase of the motor leads will provide all the protection, under these conditions, that the two- or three-coil devices will, as recommended by some manufacturers. Complete protection against overload and single-phase operation in polyphase motors must be secured by means of suitable overload features. The under-voltage features are operative only upon failure or reduction of voltage in all phases or after the overload device has performed its function. This brings out the necessity of carefully selecting overload devices. An under-voltage device is of little value unless proper overload devices are also provided. It is of course best to combine all of these features when possible in a common device.

In the April 1st issue of the Journal of Electricity in this department in the article on alternating current motor troubles it was pointed out that a three-phase motor operating single-phase will take at any load approximately 175 per cent of the corresponding three-phase current. Hence, any device which will limit the load to 25 per cent overload which is common practice will also prevent single-phase operation. This will in turn insure positive operation of the under-voltage attachment for as soon as one leg or phase of the circuit is opened, the overload device will operate and open the remaining phase, thus de-energizing the under-voltage coil and allowing the protective device to return to the off position. It is necessary, however, that the under-voltage coil be connected across the motor leads on the motor side of the protective apparatus. In protective devices for single-phase motors the under-voltage feature will, of course, operate independent of the overload device if the voltage is sufficiently low. This would be the case also with direct current devices equipped with under-voltage features.

From the safety standpoint the function of the under-voltage attachment is to protect the operator on motor-driven machines or tools by opening the motor starting or controlling device automatically in case of interruption to the supply circuit. This will prevent any possibility of accident to the operator who may be working on the machines while they are shut down due to the unexpected starting of the motor when power is again restored to the circuit.

It should be noted carefully that these rules demand devices equipped to give under-voltage protection, that is, the device must return to the off position upon reduction or failure of voltage and remain in that position.

ELECTRICITY AT THE UTAH STATE FAIR

BY C. W. KENDALL

(Dealers in electrical goods must not neglect state fairs and conventions as an effective medium of advertising. More electrical cooking equipment for commercial purposes is used in Salt Lake City than almost anywhere else in the United States—and undoubtedly this is due in large part to such effective exhibits as that of the Utah Power and Light Company at the recent Utah State Fair.—The Editor.)



Indoor View of the Exhibit of the Utah Power and Light Company

“It Electrically” was the lesson emphasized by the Utah Power & Light Company during their exhibition and demonstrations of electrical apparatus and appliances at the Utah State Fair held at Salt Lake City September 29th to October 6th inclusive. All of the leading manufacturers’ goods were represented in the practical demonstrations of the workings of electricity in the home, shop, commercial, industrial and farm uses, in an endeavor to educate the public to the

numerous advantages to be gained by its use.

The entire display was conducted on the Company’s permanent location at the Fair Grounds, occupying approximately 10,000 square feet of space. A large building occupies the center of this space, in which were demonstrated the various commercial and domestic labor saving appliances, visualizing to the thousands of visitors the many practical uses of electricity.

The approaches to the building were made very attractive by landscape work including flower beds, green parking and a “Fountain of Light” occupying the center space in front of the building. The grounds and exterior of the building were well lighted by the use of flood lights and also by a number of smaller incandescent lamps mounted on lamp posts. A large American flag on top of the building was effectively lighted by the use of flood light projectors.

The interior of the building was divided into several booths. The decorations consisted of autumn leaves and floral designs, together with a number of flags, etc. Type C-2 “Daylight” Mazda lamps were used entirely for interior lighting and created much favorable comment. Vocal and instrumental music was furnished every day under the direction of the Salt Lake Song Shop; an interesting feature of which was the fact that all instruments used were electrically operated.

The electric range demonstration in the model electric kitchen attracted more than passing interest. The perfect heat control, cleanliness, ease of operation, food saving and other features of electric cooking were forcibly brought out. Much benefit in popularizing the “electric cooking idea” undoubtedly resulted from these demonstrations.

The exhibition of Modern Electric Baking attracted universal attention. A large Hughes Electric

Bake Oven was installed and operated to its capacity during the entire week. Thousands of pieces of pastry, cake, bread, cookies, etc. were prepared and baked in full view of the visitors. In order to conserve the product, it was placed on sale by the baker at a nominal price and proved so delicious that the supply could not keep up with the demand. Salt Lake City is one of the foremost users of electric cooking equipment for commercial purposes.



The Electrical Exhibit at Night

To the north of the main building was erected a large tent in which were shown the various applications of electric power for irrigation pumping, house water pumping, feed grinding and other farm uses, also commercial and industrial applications. The large number of farmers who visited this exhibit and witnessed the operation of the various machines under actual conditions were convinced of the desirability of using electricity on the farm.

Throughout all departments particular emphasis was laid on the part electricity plays in aiding in the conservation of materials and labor, which are so necessary at the present time.

Weather conditions during the week were ideal and approximately 150,000 visitors were in attendance at the Fair, a large majority of whom visited the electrical display.

Much credit for the success of this exhibit is due to the hearty co-operation of the electrical dealers and manufacturers of Utah, among whom are: General Electric Company; Western Electric Company; Fairbanks-Morse Company; Intermountain Electric Company; Westinghouse Electric & Manufacturing Company; Eardley Brothers Company; Utah Corrugated Metal & Flume Company; Salt Lake Hardware Company; State Milling Company; Borden Milk Company; Bonnie-Goddard Company; Eureka Vacuum Cleaner Company.

FARMER RESPONDING TO ADVERTISING

An instance of the intensive application of electric power in irrigation is that of the Perris and San Jacinto valleys, California, comprising an area of approximately 70,000 acres, which are fast coming to the fore as one of the most intensively cultivated alfalfa districts of the State.

The principal factors contributing to the success of the district are the open seasons, fertile soil and a plentiful supply of subterranean water.

The methods of lifting the water to the surface, and distributing it over the lands as needed, have undergone great improvement during the last two or

three years, which has not only reduced the cost of pumping, but secured a more equable and efficient application of the water. The power for pumping was originally furnished by gas engines, but due to increasing cost of fuel oil, electricity is fast displacing the gas engines. Marked economies have been secured in cost of electric power by the construction of small, inexpensive reservoirs. Instead of pumping water direct to the lands by large pumping units, at irregular intervals, and consequent heavy cost for power, the reservoirs permit the utilization of smaller pumps and motors running continuously, which effects large savings in power cost.

Constitution of Utah Society of Electrical Contractors and Dealers

(For the upbuilding of conditions in the industry, contractors everywhere are learning to unite and pull together. As this is the latest organization of its type to be formed, its constitution will be of interest to contractors and dealers throughout the West.—The Editor.)

ARTICLE I

Name

The name of this organization shall be Utah Society of Electrical Contractors and Dealers.

ARTICLE II

Objects

The objects of this society are:

A. The development of the electrical business in the territory covered by the Society.

B. The establishment of a friendly relation between its members and between the various branches of the electrical industry in its territory.

C. The establishment of the electric contracting and merchandising business in its territory on a successful commercial basis.

D. The discussion of subjects of interest and value to the industry.

E. The dissemination among its members of accurate and reliable information pertaining to the industry.

ARTICLE III

Membership

Membership in this society shall be divided into two classes, Active and Associate.

Active members shall be electrical contractors. This term includes all persons, firms or corporations employing electric wiremen and carrying on the business of installing electrical apparatus for lighting, power, heating or other service as their main business.

Associate members shall be divided into three classes, A, B, and C.

Class A membership comprises all central stations, municipal electric light and power plants, telephone companies and electrical railroad companies and companies of like character.

Class B membership shall comprise any individual, firm or corporation, except those qualified as regular or Class "A" Associate members engaged in any branch of the electrical business, but who does not do installation work, and also any retailer handling electrical material but not engaged exclusively in the handling of the same, and also any electrical dealer or contractor coming within the division of a regular member, but operating in a territory outside of the territory covered by this association.

Class C membership shall include individuals, employees or officers of Active members and of Class A and B Associate members other than the authorized representatives of such members.

ARTICLE IV

Territory

The territory covered by this Society shall include the State of Utah and those portions of Idaho, Nevada, Wyoming and Montana regularly covered by salesmen representing Salt Lake jobbing houses.

ARTICLE V

The membership shall stand in the name of an individual representing the person, firm or corporation and the Secretary-Treasurer shall recognize such persons as authorized to represent as a member such person, firm or corporation with power to vote at meetings. Each individual, firm or corporation shall be entitled to name, in addition to the representative in whose name its membership shall stand, an alternate.

ARTICLE VI

Dues

The initiation fee of Active members and Class A and B Associate members shall be \$10.00 and the annual dues shall be \$36.00. The dues shall be paid quarterly, in advance, on the first day of January, April, July and October.

There shall be no initiation fee for Class C members; the annual dues shall be \$2.50, payable annually in advance.

If, however, any member remits for his dues within thirty days after due date for the fiscal year, he shall be entitled to a discount of 20 per cent.

ARTICLE VII

Fiscal Year

The fiscal year shall begin the first day of January each year and shall end on the following 31st day of December.

ARTICLE VIII

Suspension for Non-Payment of Dues

Any member may be expelled from the Society for non-

payment of dues, after a period of ninety (90) days from the date when the said dues become due and payable.

The membership of any member suspended as aforesaid who fails to pay such dues within ninety (90) days after suspension shall as a result of such failure and without further action in the premises terminate unless said period of ninety (90) days be extended by the Executive Committee, in which case his membership shall without further motion terminate at the end of the extended period.

ARTICLE IX

Officers

The officers of the Society shall be a President, Vice-President, Secretary-Treasurer and Executive Committee. The President, Vice-President and members of the Executive Committee, except the Secretary-Treasurer, shall be elected by ballot at the annual meeting. The Secretary-Treasurer shall be selected by the Executive Committee. The Executive Committee shall consist of the President and Vice-President ex officio, and five (5) additional members.

Only representatives of Active members shall hold office, except in the case of the Secretary-Treasurer.

ARTICLE X

Sub-Committees

The Executive Committee shall have the power to appoint such sub-committees as it may from time to time deem necessary.

ARTICLE XI

Duties of Secretary-Treasurer

The compensation of the Secretary-Treasurer shall be fixed by the Executive Committee. He shall keep the books of the Society and perform such duties as may be delegated to him by the Executive Committee.

The Secretary-Treasurer of the Society shall be custodian of the Society funds. He shall deposit such funds with banks or trust companies approved by the Executive Committee and shall file with each of such banks and trust companies a copy certified by the President of Article XI of this constitution.

He shall furnish a bond in an amount to be determined by the Executive Committee and the expense of such bond shall be borne by the Society.

The Executive Committee shall employ a certified public accountant who shall annually audit the account of the Secretary-Treasurer. Such public accountant shall file a written report of his investigation with the President and such reports shall be read at the next regular meeting.

The Executive Committee shall have control of and direct the disposition of the funds of the Society. No limitation shall be placed upon said committee's power to draw on and distribute the funds. The action of this committee must have the consent and approval of a majority of its members.

ARTICLE XII

Meetings

The annual meeting of this Society shall be held in the Fall of each year at a time and place to be designated by the Executive Committee. A regular meeting to be called a "Spring Meeting" shall be held each Spring at a time and place to be designated by the Executive Committee.

Special meetings may be called from time to time by a majority vote of the Executive Committee.

ARTICLE XIII

By a two-thirds vote of the entire Executive Committee, any member may be expelled for cause, provided, however, that such member is given an opportunity to be heard before the said committee. On the questions of such expulsions neither the accusing nor the accused member shall be entitled to vote.

ARTICLE XIV

This constitution may be revised and amended at any general meeting provided that such revisions or amendments are submitted in writing to the Secretary-Treasurer at least thirty days in advance of any regular meeting. It shall be the duty of the Secretary-Treasurer to forward to each member at least ten days in advance of any regular meeting copy of such proposed revision or amendment.

ARTICLE XV

Except where otherwise provided Robert's Rules of Order shall govern the parliamentary procedure of this Society.

THE MANUFACTURE OF CARBIDE FROM LAMP BLACK

(A recent question from one of our readers on this subject has led to investigation on our part—and the accompanying statement by E. C. Jones, of the Pacific Gas & Electric Company. A certain amount of carbon from Oakland, Cal., has been successfully used in manufacturing electric light carbons, but Mr. Jones believes that the small manufacturer can not hope to compete with the big companies of Niagara Falls.—The Editor.)

The cost of manufacturing calcium carbide is practically divided into three parts: power, one-third; material, one-third; labor and over-head, one-third.

The mixture used under the above heading of material is two-thirds lime and one-third carbon. The form of carbon used at Niagara Falls is broken hard coal, which costs \$1.40 a long ton delivered at the works. Before the war this same material cost 80c a ton. The lime at Niagara is burned in their own kilns at a cost of \$3.30 per ton delivered at the furnace. It costs 34c a ton to quarry the lime stone and it requires three tons of lime stone to make two tons of lime. One and one-half tons of the above mixture produces one ton of calcium carbide, so that there is one-third of a ton of carbon in each ton of carbide, and at the price of hard coal at Niagara there is .46 $\frac{2}{3}$ c worth of carbon in each ton of carbide, and roughly the cost of the carbon in calcium carbide is 1/60th of the total cost of the carbide.

Aside from the use of carbon in making calcium carbide, it is necessary to use lime free from magnesia, as lime containing in excess of 2% of magnesia acts as a flux and destroys the carbide. In order to use the lampblack it would be necessary to purchase this lime and make sure that it was of the right quality. This would mean constant laboratory tests or the purchase of a lime-stone quarry of suitable rock and the construction of kilns for burning lime.

The next important item is electric power, and it was discovered early in the art that the only way to get high efficiency and cheap carbide was to install very large units, and the smallest electric furnace in use at Niagara today, which gives efficiency sufficient to successfully meet competition, is 15,000 horsepower.

A plant of this description recently completed and including two electric furnaces (one only of which is used at a time), lime kilns, crushers, grinders, etc., costs \$1,500,000, and in this plant on account of the low voltage and high amperage there is \$100,000 worth of copper.

The smallest electric furnace for making carbide is 100 horsepower and it produces 4 lbs. of calcium carbide to a horsepower day, or 400 lbs. carbide total per day, and based on eastern prices the cost of operating this furnace is \$100.00 per day, or a cost of 25c per lb. for calcium carbide.

While there has been an advance in the price of carbide, the present price in San Francisco is \$90.00 per ton or 4 $\frac{1}{2}$ c a lb.

The calcium carbide manufacturers make money by the use of tremendously large electrical units with increasing efficiency from 15,000 horsepower up, but it is futile for a small manufacturer to think of going into the carbide business.

LETTER TO THE EDITOR ON ACCIDENT PREVENTION

Journal of Electricity,

618 Mission St., San Francisco.

Sir:

I have read with much interest the editorial in the October 1st issue of the Journal of Electricity, under the heading "Overdoing Accident Prevention."

We read in this editorial "that in some instances the well desired ideal of 'safety first' is being perverted into the slogan of 'safety mad,'" together with the expressed hope that the undercurrent of protest now inwardly felt among men of industrial and engineering endeavor may be at an early date lessened by somewhat more reasonable and sane demands from accident commissions and other bodies of a similar nature.

In the first instance, it is clear to us how certain individuals may become over enthusiastic and attempt to initiate requirements which are unjustifiable and beyond reason. On the other hand, despite the undercurrent of protest, a certain amount of which must always be looked for, the majority of wide awake enterprising concerns engaged in manufacturing and public service have cast aside prejudice and are receiving the full measure of benefit through an earnest campaign for accident prevention.

During a recent visit to the southern part of the State, I was very cordially received in the office of the Vice-President and General Manager of one of the public service corporations, who remarked in the course of our conversation that his company had learned to "bank on the Industrial Accident Commission." The Southern Pacific Railroad Company, in its energetic campaign for safety first is carrying out the true spirit of co-operation by encouraging its employees to make suggestions which may result in better and safer working conditions for themselves. From their reports we learn that from 1913 to 1916 inclusive 15,559 safety suggestions were received in the interest of employees, 75 per cent of which were found practical and carried out at an approximate investment of three quarters of a million dollars. This was all done voluntarily and is by no means considered a burden to this industry.

The management of one of our large cement plants writes us that the result of their safety first activity shows a monetary saving of \$50.00 a day.

It would appear to the hard headed business man that this is worth looking into.

We read according to the report of M. Andre Tardieu, the French High Commissioner to the United States, that during the last six months of 1916 the casualties in the French Army numbered only a little more than 1% of those under arms. This included the Somme Offensive and the Fall Drive against Verdun. It is also noted that the percentage of casualties in this war is less than in the last year of our Civil War. It would be difficult indeed to find a true American who would lift his voice against building up the "Red Cross" fund to alleviate the suffering of our defenders at the front who fall in the battle for world freedom. Who, then, can consistently protest against the activity of commissions or individuals which has the effect of lessening the suffering and decreasing the fatalities to our industrial soldiers who are falling at their posts while playing their part in the struggle for world freedom?

The United States Government has seen the advisability of taking very definite steps for the protection of those who are now employed in government shops such as at Navy Yards, Arsenals, etc., through the United States Employees Compensation Commission.

After due thought we must come to the conclusion that it is just as essential to provide means for protection of those in industry as those on our battle front.

Very truly yours,

ROBT. L. ELTRINGHAM, Electrical Engineer.

WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(The contractor, the central station man, the engineer, the man in every branch of electrical industry has his own ideas how to improve the apparatus which passes through his hands. For the man who may some day become an inventor and for the man who must deal with him, this department is to be conducted. The present article covers the general foundations of patent law and points out some of the recent electrical inventions which have come from the west. The authors are members of the firm of White and Prost, prominent patent attorneys of San Francisco.—The Editor.)

NOTES ON THE LAW OF PATENTS

The present is an era of invention by the trained engineer and chemist and of great business enterprises founded on patent protection. In representing his client's interests the engineer is frequently confronted with patent problems. Whatever may be his personal views in respect to patents and inventions, he must appreciate the possibility and danger of his client becoming involved in infringement or other patent controversies. In order to perform his full duty to his client and safeguard his client's interests, the engineer must have a fairly good knowledge of patents and must know the elementary principles of patent law. Much patent litigation may be avoided if the engineer in charge of a concern's new development work has knowledge of the law of patents sufficient to enable him to realize a patent problem exists and to intelligently attempt to solve the same without involving his client in unnecessary litigation. Furthermore, many valuable patent rights are lost through ignorance of the patent law.

Abraham Lincoln once said that the American patent system is intended to "add the fuel of self-interest to the fire of genius."

The power of the United States to grant to inventors certain exclusive privileges is derived from the following clause in the eighth section of the first article of the Constitution:

"The Congress shall have power * * * to promote the progress of Science and Useful Arts, by securing for limited Times, to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."

Acting under such authority, Congress has passed four Acts, which have in turn been the basis of our entire patent system: the Acts of 1790, 1793, 1836 and 1870. The Act of 1870 became the basis of the present provisions of the Revised Statutes controlling patents.

Under the English kings, various monopolies were granted to individuals by public letters addressed to the general public. From the Latin name of these letters, "literae patentes" is derived "letters patent," meaning open letters or letters addressed to the public. It is by such "letters patent" that the United States grants certain exclusive privileges to inventors.

What Inventions Are Patentable

Section 4886 of the Revised Statutes of the United States provides that:

"Any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvements thereof, not known or used by others in this country, before his invention or discovery thereof, and not patented or described in any

printed publication in this or any foreign country, before his invention or discovery thereof; or more than two years prior to his application, and not in public use or on sale in this country for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the fees required by law, and other due proceeding had, obtain a patent therefor."

Patent Defined

A patent for an invention is a contract between the party claiming to be the inventor thereof and the Government. In consideration of the inventor disclosing his invention to the public, the Government grants him, for the period of seventeen years, the right of preventing all others from making or using or selling his invention. At the end of such seventeen year monopoly, the public is free to make, use or sell the invention. It is to be noted that an United States patent grants no right to make, use or sell anything; it grants only the right of preventing all others in the United States from making, using or selling the invention covered thereby.

The law does not require the owner of a patent to make any use of the invention covered thereby. If the patent power so desires, he may refrain from making, selling or using any device embodying the patented invention and, at the same time, prevent all others from making, selling or using such devices.

Inventors

"The right of property which an inventor has in his invention, is excelled, in point of dignity, by no other property right whatever. It is equaled, in point of dignity, only by the rights which authors have in their copyrighted books. The inventor is not the pampered favorite or beneficiary of the government, or of the nation. The benefits which he confers are greater than those which he receives. He does not cringe at the feet of power, nor secure from authority an unbought privilege. He walks everywhere erect, and scatters abroad the knowledge which he created. He confers upon mankind a new means of lessening toil, or of increasing comfort; and what he gives cannot be destroyed by use, nor lost by misfortune. It is henceforth an indestructible heritage of posterity. On the other hand, he receives from the government, nothing which cost the government or the people a dollar or a sacrifice. He receives nothing but a contract, which provides that for a limited time he may exclusively enjoy his own. Compared with those who acquire property by devise or inheritance; compared with those who acquire by gift or marriage; compared with those who acquire property by profits or sales, or by interest on money, the man who acquires property in inventions, by creating things unknown before, occupies a position of superior dignity. Even the man who creates value by manual labor, though he rise in dignity above the heir, the donee, the merchant, and the money-lender, falls in dignity below the author and the inventor. The inventor of the reaper is entitled to greater honor than his father who used the grain cradle, and the inventor

of the grain cradle is entitled to greater honor than his ancestor, who, for a hundred generations, had used the sickle. Side by side stand the inventor and the author. Their labor is the most dignified and the most honorable of all labor; and the resulting property is most perfectly theirs." (Walker on Patents.)

As said by Francis Bacon:

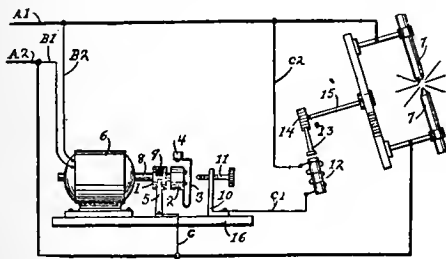
"Now among all the benefits that could be conferred upon mankind, I discovered none so great as the discovery of new arts for the bettering of human life. For I saw that among the rude people of early times, inventors and discoverers were reckoned as gods. It was seen that the works of founders of States, law-givers, tyrant-destroyers, and heroes cover but narrow spaces, and endure but for a short time; while the work of the inventor, though of less pomp, is felt everywhere, and lasts forever."

To the same effect are the following remarks of Judge Grosscup:

"Inventive genius has given to mankind most of its present material civilization. The magnificent flower of civilization, everywhere surrounding us, has opened from germs that were fructified from the brains of inventors."

1,239,720. Carbon Feeding Mechanism. Walter G. Preddey, San Francisco, Cal.

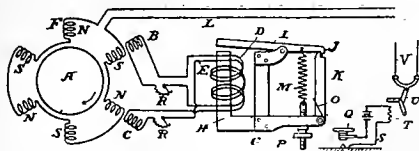
This invention relates to electric arcs and particularly to means for varying the distance between the carbons in accordance with variations in voltage in the arc circuit.



Shunted across the circuit is a small motor, the speed of which varies with the voltage. A centrifugal switch rotatable with the motor armature operates at high speeds of revolution to close a circuit containing the carbon feeding electro-magnet.

1,239,795. Protective Device. Ernest O. E. Klippahhn, Dobbin, California.

This invention relates to a protective device for electric motors and operates to display a signal when an unsymmetrical condition obtains in the field windings. A differential electro-responsive device is provided with coils associated



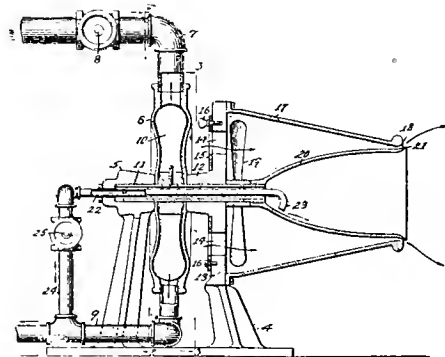
each with different field coils and an unbalanced condition in the field coils causes the differential responsive device to operate and display a signal.

1,239,465. Solder. William A. Day, Bellingham, Washington.

This patent discloses a material for soldering cast iron, mild steel, aluminum and other metals and is composed of an alloy of five parts lead, five parts tin and one part zinc.

1,240,683. Oil Burner. Theron C. Curtiss, San Francisco, California.

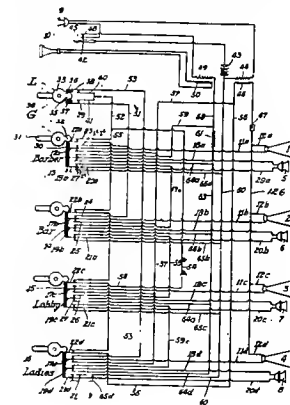
This patent discloses an oil burner comprising a shell within which is arranged a bell having a fan attached thereto which blows air through the shell when the bell is rotated.



Secured to the bell shaft is a rotor which is driven by the flowing oil under pressure. The oil which is burned is taken from the fuel circulating pipe and conveyed into the bell through a tube.

1,239,607. Telephone Paging System. Nathan A. Kurman, Oakland, California.

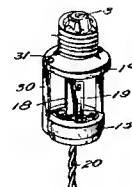
This invention relates to telephone systems employing loud speaking receivers located throughout an establishment



so that announcements may be made or persons called in a loud voice. The system is designed so that the announcement may be made at all stations or at one selected station.

1,239,731. Separable Plug. Milton H. Shoenberg, San Francisco, California.

The invention relates to separable electric plugs composed of base and cap members and the invention consists in securing a rigid element to one member which engages the



other member, so that the members may be separated only a limited distance. This distance of separation is sufficient to separate the contacts, but when so separated, the two parts of the plug are still held together.

SPARKS—Current Facts, Figures and Fancy

(Substitutes have played a great part in this war—and it is not the least interesting development of the shortage in all lines to note in how many cases electricity is proving the substitute. Gasoline, coal, nitrates from the air—the labor supply—in each case electricity has come to the rescue. Ingenious new applications of electrical devices are always diverting.—The Editor.)

The Harvard racing crew is being trained by the aid of electricity. Small electric lights have been placed on every oar so that the coach in watching may catch errors in alignment.

* * *

To provide sunlight to pour through the stained glass windows of a church—is the latest use found for the new daylight lamps. A church in San Jose is featuring the lighting of its "Resurrection Window" in local notices of its evening services.

* * *

It is reported that in the field of the exploitation of nitrates directly from air a new process has been discovered in Germany which works with quadruple air velocity through the reaction space and produces a result about 80 per cent higher than could be obtained before.

* * *

A scheme to make even a cold wind warm his home has been worked out by a man in Wisconsin who uses a couple of windmills on his farm to charge storage batteries with which to light and heat the house, run his automobile and keep no end of farm machinery going. Here is a case of getting electricity from the air, indeed.

* * *

The city of Cleveland recently tried the experiment of running a municipal electrically operated cold storage plant. The project proved to be a failure, however, due to high costs of maintenance and to the difficulties of the constant opening and closing of the refrigerating chamber. The plant is now being used for commercial purposes.

* * *

Coal gas is proposed as a substitute for gasoline in England. The Bureau of Mines in this country is working toward the use of an economical type of engine in our four million automobiles. By this means they hope to reduce the consumption of gasoline from twenty to ten billion gallons a year. Why not save some of it by using electricity?

* * *

The Food Conservation campaign in a way is an electrical issue. The great amount of outdoor advertising is largely by electric signs, films run by electricity are being shown in moving picture houses, electricity is being advocated as a coal saver, electric refrigerating plants are being erected to meet the demands, electric fans advertised for the drying of food.

* * *

Udovletvoritelni means "satisfactory" in Russian and when you remember that the H sounds like N, the P like R, the N like I, the X like H, the C like S and the Y like U, it is very simple. It is a word which we hope to hear often when our electrical indus-

try begins to take advantage of new opportunities in Russia.

* * *

The first American-built long distance telephone line in France has been completed by the army signal corps of engineers. Except the poles, which were made from French trees, everything for the line was brought from America. It is said to be a great treat for the officers to be able to take the receiver off the hook and talk through an American instrument instead of the dubious types used on the continent.

* * *

The horse has been reduced to horsepower by C. O. Crane of the Idaho Power Company. In advocating the use of electricity on the farm, he points out that a horse worked in the average routine of a farm day can furnish energy at about 15½ cents per kilowatt hour. Man power comes to \$2 for the same unit. Twelve cents is the cost of a kilowatt hour when a one-eighth horsepower motor is substituted.

* * *

The electrical industry along with the rest of the world has had to learn the use of substitutes—and has found occasionally to its surprise that the substitute was better than the original. An instance of this in another field is shown in the use of sphagnum, or peat moss, as a surgical dressing. Although it was a forced substitution, it has been found a great improvement over cotton, the fibres not adhering to the wound but allowing easy removal. The plant grows abundantly in damp places in Western Washington.

* * *

The High Cost of Labor has struck Japan. The Far East Commercial Supplement states that the Railway Board has decided to raise the wage standard. Officials receiving less than 40 yen (\$19.94) per month are to have a 2-yen (\$1) increase, and those who are paid per diem are to get 6 sen (3 cents) more each working day. "Two yen a month seems to be a small sum, but it means a great deal to this class of workers. All private establishments will probably follow suit," the newspaper states.

* * *

Electric plowing is used considerably in Germany, where it has been carried on for about 15 years, and to a lesser extent in Italy and other European countries. One system in use has mounted on the plow a 100-horsepower motor-operated drum around which a cable makes a few turns and then attaches to anchor wagons at each end of the field, these wagons being automatically moved the required distance at each reversal in the process of plowing. The energy is derived from a 2-wire trolley supported by the wagons. The machine plows in both directions by a reversal of the shears.

PERSONALS

Frank Fagan, western manager of the Edison Lamp Works with headquarters in San Francisco, recently delivered an excellent lecture before the Northwest Electric Light and Power Association at Spokane, Wash., along lines that will be of great assistance to central stations in selling the electrical idea for better lighting in the homes of consumers. Interesting portions of this lecture, together with illustrations appear elsewhere in this issue. Such work as this has a high educative value for widely disseminating the strong features of recent advances in lighting methods and should receive the encouragement and moral support of all. Incidentally Mr. Fagan is receiving congratulations on all sides due to the fact that a bouncing baby girl arrived in his household on the evening of October 21st, Edison Day, of which he was the originator. This day commemorates the birth of the first incandescent lamp invented by Edison Oct. 21, 1879.



Lee R. Cooke has been appointed city engineer of Nampa, Idaho.

J. P. Bell, Pacific Coast manager Standard Underground Cable Co., is visiting Portland and Seattle.

S. B. Fortenbaugh of the foreign department of the General Electric Company and his wife are visitors on the Pacific Coast.

C. R. Dederick of the Fobes Supply Company at Portland has resigned his position to join the Keeler White Company at San Francisco.

Robert W. Thompson has been appointed district engineer for the Government of British Columbia, with headquarters at Kamloops, B. C.

J. T. Stewart, formerly with the Electric Railway and Manufacturing Supply Company, is now with the Standard Electric Construction Co. of San Francisco.

E. O. Shreve, assistant manager of the San Francisco office of the General Electric Company, is in the East and will not return until about the middle of November.

John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, has been elected chairman of the San Francisco Chapter of the National Red Cross.

Charles N. Black, of the firm of Ford, Bacon & Davis of New York City, formerly vice-president and general manager of the United Railways of San Francisco, is a recent San Francisco visitor.

D'Arcy Ryan was the originator of the lighting effects used to such good purpose in the Noah's Ark Pageant given recently at Sutro Baths, San Francisco for the benefit of the Allied War Relief and Tobacco Funds.

Milton Henoeh of the Supply Department of the Westinghouse Electric Company has been on the coast for the last month. He is now in Los Angeles and plans to stop off at Salt Lake City and Denver on his way east.

R. C. Coffy, vice-president of the Puget Sound Gas Company, has been appointed a member of the committee of five to draft constitution and by-laws for a new civic booster club for Everett (Wash.) merging the city's present commercial clubs.

A. Brewster Hall, district sales manager of Pass-Seymour Company of Syracuse, New York, attended the quarterly meeting of the California Association of Contractors and

Dealers at Fresno and has since been spending a few days in San Francisco.

A. S. Halls was elected president of the Oregon Association of Electrical Contractors and Dealers and the association members consider the organization fortunate in securing such an able electrical engineer and contractor as its executive head for the coming year.

A. S. Kalenborn is now electrical engineer and superintendent of power for the Cerro de Pasco Mining Company, Cerro de Pasco, Lima, Peru. He formerly was electrical engineer for the San Joaquin Light & Power Corporation, California.

Charles W. Reid, vice-president of the Rathbone, Sard & Company of Chicago, manufacturers of electric ranges, is an interested Pacific Coast visitor and has recently added enthusiasm to the electrical industry in the West by talking at the San Francisco Electrical Development and Jovian League.

W. E. Jones, western manager of the Economy Fuse Company with headquarters at Seattle, and J. C. Manchester, the new San Francisco representative of this company, were interested attendants at the recent quarterly meeting of the Pacific Coast Electric Supply Jobbers at Beverly Hills near Los Angeles.

Thomas Roberts has been named the third member of of the arbitration board to settle the wage dispute between the Portland Railway, Light & Power Company and the street car operators. Otto R. Hartwig of the State Federation of Labor represents the carmen's side of it and John P. Newell, consulting engineer, the company.

Tracy Bibbins and Harry Noack of the Pacific States Electric Company; Garnett Young of the Telephone Electric Equipment Company; W. M. Deming, business manager, and Robert Sibley, editor of the Journal of Electricity are among those who journeyed southward to attend the recent quarterly sessions of the Pacific Coast Electrical Supply Jobbers at Beverly Hills near Los Angeles.

F. E. Kearney, R. M. Alvord, C. S. Hull and F. D. Fagan were among the heads of departments who attended the pleasant reception given recently by Miss H. R. McDonald, head of the welfare work of the General Electric Company at San Francisco to the women employees of that company. F. F. Barbour and F. M. Ray as former heads of departments were also included among the guests.

S. C. Jaggat, owner and manager of the Morrison Electric Company of Portland, Oregon, attended the recent National Electrical Contractors' Association convention held in New Orleans as Oregon's delegate. Mr. Jaggat who is a very progressive electrical dealer also went on to New York to attend the Jovian convention in that city and to find anything new there might be in the electrical line, and will return about the first of November.



A group of bold fishermen: O. B. Stubbs, S. W. Peterson, C. M. Wills, F. N. Averill, H. B. Squires, H. E. Anderson. Can you place any of them in the picture?



Here are two mighty hunters, known to men of the electrical industry as "Sandy" and "Stubs." The wire shown to the left is to provide telephone communication to report to a waiting world their deeds of valor.

Wm. S. Cone has resigned as manager of the U. S. Reclamation Service's Salt River project at Phoenix, Arizona, to form an engineering partnership with Irving C. Harris of Los Angeles, and has opened consulting offices in the Hollingsworth Building, Los Angeles. Mr. Cone was closely identified with the design and construction of several of the early hydroelectric installations of the West, including those of the Southern California Edison Company. Later he was associated with the late H. H. Sinclair in the Great Western Power Company's developments and subsequently was manager of the Sacramento district. Then he joined the Reclamation Service and now is again in private practice, to which he brings a broad experience and wide acquaintance. Mr. Harris, likewise, is thoroughly equipped from a technical standpoint for consulting electrical work.

J. C. Martin, chief engineer of the Pacific Power and Light Company, has resigned his position to accept service with the Lehigh Securities Corporation with headquarters at Allentown, Pa. Mr. Martin came with the Pacific Power and Light Company in its early days of organization and not only has he contributed noteworthy effort in his company's engineering organization but he has performed lasting work on many committees of the Northwest Electric Light and Power Association, especially along the lines of drawing up proper rules for overhead line construction and telephone inductive interference. As chairman of the Technical and Hydro-Electrical Committee for two years he has come in close touch with engineers the country over, but especially throughout the Northwest. The engineering fraternity of the West bemoan his retiring from endeavor in this section of the country, but the best of good wishes go with him in his new field of work.

Ira Nelson Hollis, president of the Worcester Polytechnic Institute and president of the American Society of Mechanical Engineers, arrived on the Pacific Coast during the current week. Mr. Hollis is making a tour of the country in the interests of the United States Government. He is recruiting high-class engineers to work on the big war problems facing the Government. At both Los Angeles and San Francisco, engineers of the coast made elaborate plans for his entertainment. He was shown about the cities, introduced to the men of his profession and to the big engineering projects now under way. A banquet was given in his honor at the Palace Hotel. Prominent engineers from all the bay counties attended this banquet and the four engineering societies of San Francisco participated in the program. These included the local sections of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Society of Chemical Engineers and the American

Institute of Mining Engineers. Each had a representative speaker. The speakers were Professor Harris J. Ryan, professor of electrical engineering, Stanford University; C. D. Marx, professor of civil engineering, Stanford University; T. A. Rickard, editor of the Mining and Scientific Press; L. H. Duschak of the United States Bureau of Mines and B. F. Raber, assistant professor of mechanical engineering, University of California.

OBITUARY

John M. Winslow, sixty-one years of age, one of the pioneer telephone builders of the state of Washington, recently died at his country home near Silver Lake, Snohomish county. Mr. Winslow was born in Philadelphia. As a civil engineer he was engaged for a number of years in Mexico. Going to the Pacific Northwest he settled in Tacoma, and fifteen years ago he went to Seattle to reside. He held the position of secretary-treasurer of the Puget Sound Telephone Company and was active in the company's affairs up to the day of his death.

AN AMERICAN ACADEMY OF ENGINEERS

A bill recently before the Senate recommended the incorporation of an American Academy of Engineers. Gen. Geo. W. Goethals, Dr. S. W. Stratton, Director of the Bureau of Standards, and many other expert engineers and scientists strongly support the measure.

The objects of the proposed organization are first to render loyal and effective service to the government of the United States as far as lies in its power, and second to advance in every legitimate manner the interests and welfare of the engineering profession in all its numerous branches. The establishment of such an academy has been under consideration for eight years.

PROVIDING COAL FOR PUBLIC UTILITIES

It will be the duty of local committees on Fuel Administration to enforce regulations of the Fuel Administration in their districts, to report general conditions to the State committees, to arrange for supplies in case of shortage, and to hold local hearings on infractions of rules.

Twenty per cent of the industrial concerns asking for coal do not need it, according to L. A. Snead, of the Fuel Administration. He told of one factory that was discovered to have a reserve of 204,000 tons of coal, a year's supply, photographs of which are in possession of the Fuel Administration. Mr. Snead did not, however, belittle the claim of the manufacturer who really needs coal. He told in detail of supplying emergency needs for industrial and public utility companies. In the past two weeks the Fuel Administration has distributed approximately 3,000,000 tons for Government requirements to some 2000 locations.

TACOMA RAILWAY & POWER COMPANY'S REPORT

The annual report of the Tacoma Railway & Power Company has been filed with the public service commission, covering the financial operations of the company for the calendar year 1916.

During the year 23,615,660 passengers were carried of which 5,753,037 were free transfer passengers. In addition 802,405 employees and other persons were carried free, a total of 24,418,065.

The total operating expenses were \$689,103.40 for the year. This amount included \$436,207.77 wages and salaries paid during the year. The average fare collected was 3.69 cents per passenger. But two fatal accidents occurred during the year.

The company had 99 passenger cars and 65 freight cars in operation and the total track mileage, 106.2 is the largest of any city in the United States in proportion to population. The company paid \$8,646.79 taxes for the year covered by the report.

MEETING NOTICES FOR ELECTRICAL MEN

(The Quarterly Meeting of the California Association of Electrical Contractors and Dealers held at Fresno has constituted the most important meeting of men of the industry during this semi-monthly period. The Pacific Coast Electrical Supply Jobbers' Association, another most important gathering, is now at session at Beverly Hills as these forms go to press. Other meetings of electrical interest are noted below.—The Editor.)

Fresno Meeting of California Association of Electrical Contractors and Dealers

The regular quarterly meeting of the California Association of Electrical Contractors and Dealers was held at Fresno, California, Oct. 12-13. The outstanding features of the meeting were the preliminary report of the legislative committee on the state ordinance for licensing contractors and the report of the retail committee on the proposed co-operative selling campaign.

The license measure proposes that a state examining board of three or five members be appointed to pass upon the qualifications of all contractors entering the electrical business. The expenses of the board would probably be met by a system of fees required from all working contractors. These proposals will be shaped into a bill to be presented at the next meeting of the legislature.

The retail committee's report gave the outline of the proposed selling campaign to be conducted jointly under the auspices of the light and power companies, contractor-dealers, and jobbers. The contractor-dealers and jobbers have pledged \$7000 toward the estimated cost of \$14,000 for the first year's campaign and are now awaiting the action of the central stations in raising the balance.

H. W. Kimball presented a constructive report as delegate to the contractors' conventions at Vancouver, Spokane and Eugene during September. The British Columbia association has 98 per cent of the contractor-dealers in the territory as members. The organization is in a strong position and working very closely with the other electrical interests. An extended review was given of F. B. Milligan's discussion on the credit relations between the contractor-dealer, the jobber and the public wherein he recommended an improved form of contract, prescribing time and percentages of payment for work done. He also reported the proceedings of the Washington and Oregon associations, details of which have already been published in these columns.

W. D. Kohlwey, the delegate to the national convention at New Orleans, telegraphed a brief report of progress there, including the appointment of H. C. Reid as chairman of the Pacific Coast Section and of P. S. Butte, E. E. Brown and H. C. Reid as the San Francisco committeemen, H. W. Kimball and C. W. Kenney as the Oakland representatives, and J. F. Rendler and G. E. Arbogast at Los Angeles, together with the secretaries of the state and several local associations

as well as members of the national association in other towns.

The association subscribed \$500 toward the purchase of Liberty Bonds and selected Santa Barbara as the meeting place for the annual convention in June, 1918.

At the banquet on Saturday night the principal speakers were W. M. Deming of the Journal of Electricity, D. E. Harris of the Pacific States Electric Company, E. B. Walthal of the San Joaquin Light & Power Corporation, and Albert H. Elliot, secretary of the jobbers' association. Mr. Deming emphasized the need for co-ordination of effort and outlined what the

contractor-dealers should do to merit the central stations' turning over to them the merchandising of appliances. Mr. Harris spoke of the awakening of the electrical industry. Mr. Walthal told how the dealers could work more closely with the central stations. The session was closed with a characteristically fine address by Mr. Elliot on the relations between the contractor-dealers, jobbers and power companies.

Special mention should be made of the excellent arrangements, beautiful decorations and fine entertainment provided by the Fresno reception committee. Each delegate was presented with a basket of grapes and every attention paid to his personal comfort.

San Francisco Electric Development and Jovian League

The Smoker set for Thursday evening, Nov. 1st under the able leadership of R. F. Behan of the Westinghouse Electric & Manufacturing Company with the skit entitled "An Inductive Interference Morning" has evidently a scream in it from start to finish. From the advanced sale of tickets

it appears that the meeting will be widely attended.

The meeting of the League for Wednesday, October 17 was ably conducted by Harry Bostwick of the Pacific Gas & Electric Company who introduced Senator Cutten, the well-known attorney of his company, as speaker of the day. Mr. Cutten read a paper on the new income tax which is so timely in its helpfulness that it is printed in full elsewhere in this issue.

The meeting of the League for Wednesday, October 24 was a memorable one.

The new executive committee has evidently some real activities ahead, well worthy the serious attention of men of the industry.

An outline of the program for meetings in the near future was given by Robert Sibley, President of the League. These include an Electrical Industry and Electrical Contractors and Dealers Day, with Arthur Kempston of the Depart-

BUILDERS OF THE WEST—XVI.



JOSEPH N. LE CONTE

"Little Joe" is a term of endearment known to that large group of engineers who have had the privilege at one time or another of registering in courses of engineering mechanics and hydraulics at the University of California. Here is an instance of how a quiet, unassuming personality manifests itself in the lives of men and has added its quota as a Bullder of the West. To Joseph N. Le Conte, professor of engineering mechanics at the University of California, an engineer of marked research attainment and unusual ability as a teacher of severe analytical and mathematical subjects, this issue of the Journal is affectionately dedicated.

ment of Electricity, San Francisco, and Robert Eltringham of the California Industrial Accident Commission as speakers, a proposed invitation to the California Railroad Commission to attend the League in a body as guests of honor for the day, a University Day, State Engineers' Day, and Old Timers' Day are also to be added, to aid the co-operative spirit so manifest at the meetings.

A glowing compliment was paid to electrical engineers by Capt. Boyden when he stated that big men in that branch were offering their services in a way that no other branch was doing.

Pacific Coast Gas Association

The following members of the Pacific Coast Gas Association were elected to serve as officers and directors for the coming year:

John D. Kuster, president, Pacific Gas & Electric Company, San Jose; A. B. Day, vice-president, Los Angeles Gas & Electric Corp., Los Angeles; Henry Bostwick, secretary-treasurer, Pacific Gas & Electric Company, San Francisco. Directors: John A. Britton, Pacific Gas & Electric Company, San Francisco, Cal.; Geo. P. Egleston, Coast Counties Gas & Electric Company, San Francisco, Cal.; B. S. Pedersen, George M. Clark & Co. Div., San Francisco, Cal.; D. J. Young, San Diego Cons. Gas & Electric Company, San Diego, Cal.; Samuel C. Bratton, Portland Gas & Coke Company, Portland, Ore.; F. S. Wade, Southern Counties Gas Company, Los Angeles, Cal.; Leon B. Jones, Pacific Gas & Electric Company, San Francisco, Cal.

The Twenty-Sixth Annual Convention of the Pacific Coast Gas Association will meet at Los Angeles, California, in September, 1918.

San Francisco Engineers' Club

The San Francisco Engineers' Club held a rousing house warming on the evening of Friday, October 26, 1917. The annual election of officers took place with the following results: President, B. P. Legaré; vice-president, W. H. Shockley; secretary, A. E. Chandler; treasurer, J. T. Whittlesey. Directors: C. W. Merrill, E. O. Shreve, H. W. Crozier, W. W. Briggs, E. B. Bumsted, C. H. Snyder, C. C. Broadwater and Ely Hutchinson. The principal feature of the evening was a rousing address by Dr. Ira Hollis.

Oakland Jovians Meet

"What the Electrical Industry Can Do Toward Helping the Government in the Present Crisis" was the topic of an address by Ezra Decoto at the fall luncheon of the Jovian Order in the Hotel Oakland Oct. 25, 1917. Henry Spott Mellman presided. Other speakers were Frank A. Leach, Jr., Norman Ellis, Hugh Kimball, Rodney Kenyon and Ross Gilson.

The Los Angeles Jovian Electric League

The Los Angeles Jovian Electric League has entered upon a new era of usefulness with the election of H. N. Sessions, commercial engineer of the Southern California Edison Company as its president.

Other officers elected are as follows: K. E. Van Kuran, first vice-president; G. E. Arbogast, second vice-president; W. C. McWhinney, secretary and treasurer, and the following directors: R. H. Ballard, J. O. Case, R. Walfsburg, A. B. Day, E. P. Morphy and F. J. Airey.

The meeting for October 17, 1917 had as its invited guests Wm. G. McAdoo, Secretary of the Treasury; Laird J. Stabler, professor of chemistry University of Southern California; Hughie Mack, Anthony Carlson, and Arthur M. Fournier, all men who can add zest to any gathering.

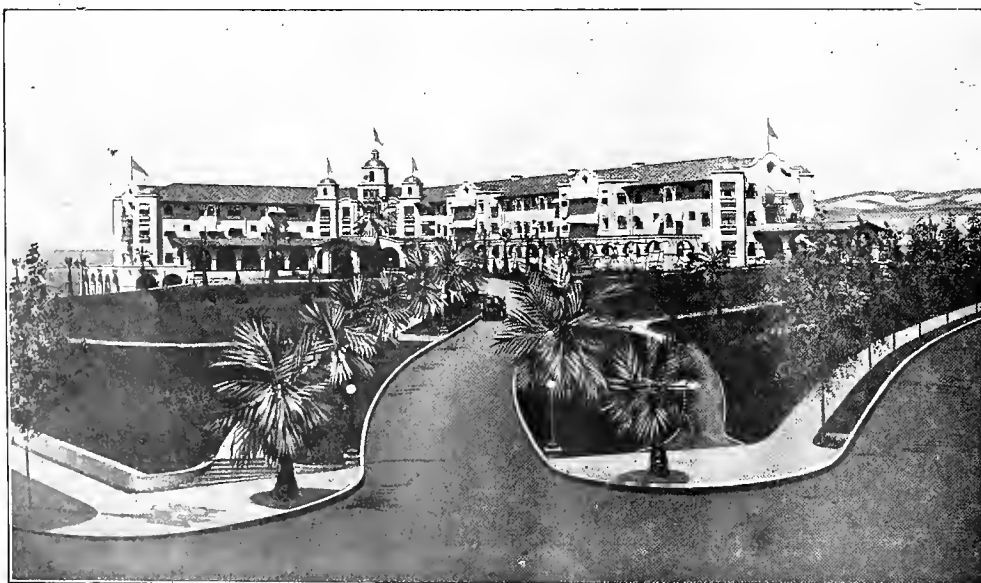
Jovians from all sections of the country will receive a hearty welcome at these Los Angeles gatherings.

Oregon Society of Engineers

The first lecture of the Oregon Agricultural extension courses given under the auspices of the Oregon Society of Engineers, was delivered on Saturday evening, Oct. 6th by Professor Otto B. Goldman, at the lecture room of the East Side Branch Library, this being the initial lecture of the Thermics Course. The attendance and interest shown indicated that this course will prove to be of great benefit to the members.

The next lecture was that by Professor C. B. McCullough, being Lecture No. 1 of the course in Structural Engineering, on Saturday evening, Oct. 13th, at the same place.

These series of lectures are to continue on Friday and Saturday evenings with intermission for the holidays up to the close of the University term in June of 1918.



BEVERLY HILLS HOTEL

Here may be seen the beautiful and fascinating headquarters of the Pacific Coast Electrical Supply Jobbers' Association which is holding an interesting session at Beverly Hills as these forms go to press. As we scan this picture the scenic charm overcomes us—but also—where are the happy care-free jobbers? Look in the windows and observe them in thoughtful session, or search out the golf course—ah, there they are! The next issue of the Journal of Electricity will inform its readers of some of these thoughtful sessions and introduce them to the champions of the golf course that will have been brought into the limelight by that time.

HAPPENINGS IN THE INDUSTRY

New Power Loads

Electrical equipment has been installed at Higgins-Bielenberg and the Lake Shore properties at Twin Bridges. Mines will work to their maximum. The companies figure the line will pay for itself in a year's time in the fuel saved.

The Soldiers' Home at Columbia Falls, Montana, has installed an electric 80-loaf bake oven which is being served by the Northern Idaho & Montana Power Company. All baking and roasting of meats for the home is now being done electrically.

The Albany, Oregon, division of the Oregon Power Company has placed 47 electric ranges during a four months' campaign, and has prospects for a considerable number of additional sales. Contract has been secured with a saw mill adjacent to the company's 11,000-volt line between Corvallis and Philomath, covering its electrical energy requirements amounting to 45 horsepower in motors.

The Holt Manufacturing Company of Stockton, Cal., which is being served electrically by the Western States Gas & Electric Company, has increased its requirements by 150 horsepower in motors. The company is also supplying an additional 75 horsepower for the Stockton Fire & Enamel Brick Company, the total electric load of this plant now amounting to 255 horsepower in motors.

New business secured by the Stockton division of the Western States Gas & Electric Company includes approximately 60 horsepower in motors for the Sperry Flour Company. It is anticipated that this load will be increased until the entire requirements of the Sperry Company—amounting to between 700 and 800 horsepower—is being served by the Western States Company.

The Arkansas Valley Railway, Light and Power Company will furnish electric energy amounting to from 300 to 400 horsepower in motors for the operation of the Holly Sugar Company's plant at Swink, Colorado. The new zinc mill to be constructed at Canon City will also be served by the Arkansas Valley Company. Its original requirements will amount to 100 horsepower in motors, to which it is expected that 100 horsepower units will be added from time to time.

Washington Water Power Company, Spokane, is disposing of more than 40,000 h.p. of electricity monthly at the present time as compared with about 33,300 a year ago or an increase of 20 per cent, according to C. S. McCalla, vice-president and general manager. This includes the additional power being used in the Coeur d'Alene and other mines as well as that used by business houses, private consumers and by the Bunker Hill and Sullivan Mining and Smelting Company in its new smelter at Kellogg.

New Buildings and Companies

North Star Power Company has bought the electric lighting business of R. H. Clow.

Calistoga Electric Company has removed its headquarters from Oakland to San Francisco.

J. A. Hunt of Pleasanton will open an electric store in Antioch, Cal., in the near future in a salesroom occupied by the Delta Electric Company.

The Rainier Heat & Power Company, Oriental building, Seattle, Wash., has a permit to make repairs at 504-16 Fifth Avenue South at a cost of \$2000.

A building permit has been granted the General Electric Company for repairs to the amount of \$5000 to be made on their property at 16th and Campbell streets.

The Toyo Electrical Industry Company has been formed by J. Odaka and associates, to manufacture electrical supplies and apparatus at Nagoya, Japan, with a branch at Tokyo.

Kilbourne & Clark Manufacturing Company of Seattle, Wash., maker of wireless apparatus, is now moving its plant from the Poulson building to its new location on the East Waterway.

The Oakland Mazda lamp factory has taken out a building permit for an addition to its plant. The cost of the expansion will total close to \$100,000, \$85,000 going for the building and the balance for equipment.

The transformer building at Camp Lewis is 27 by 27 feet and 31 feet high. It is built of paving brick. Inside is a balcony 12 by 15 feet above a concrete base on which the transformer will be placed. Three 55,000-volt wires lead to the building.

The Oregon Power Company at Dallas, Ore., is putting in some important improvements in its power house in Dallas. The old 150 horsepower engine is being taken out and is to be replaced by one of 750 horsepower, which is in fact capable of generating 1000 horsepower of "juice." A 450 kilowatt generator is being installed.

A deal has been consummated by which A. Welch has acquired the water and electric holdings of The Washington-Idaho Water, Light & Power Company. The new company will be known by the same name, but the offices have been moved from the old location in the Adams block to the corner of Main and Third streets, at Clarkston, Wash.

Kilbourne & Clark Manufacturing Company, manufacturers of wireless apparatus, has moved from the Polson building, Seattle, to a concrete building recently purchased on the East Waterway. The force is to be increased to 350 or 400 men. The present force consists of 125 men. The company is busily engaged in getting out important government work, contracts for which were secured some time ago.

Changes in Rates and Wages

The application of the Tualatin Valley Electric Company to increase its rates for service in the towns of Tualatin, Sherwood and Tigard and surrounding rural communities has been allowed by the Oregon Public Service Commission.

The Tillamook County Mutual Telephone Company of Oregon has petitioned the public service commission for permission to increase its residence telephone rates from \$1 to \$1.25 a month and its business telephone rates from \$1.50 a month to \$1.75.

Finding that the earnings of the Cheney Light & Power Company of as high as 35 per cent a year are excessive, the public service commission, upon the complaint of the residents of Cheney, has directed a reduction in rates that will cut the profits to about 8½ per cent.

Assistant Corporation Counsel Walter F. Meier of Seattle was in Olympia recently appearing for the city in a writ of review granted by the Thurston county superior court on an order of the State Public Service Commission, eliminating four cent car tickets so far as the Puget Sound Traction Light & Power Company is concerned.

By a two-to-one vote, the Public Service Commission denied the application of the Portland Railway, Light & power Company for a 6-cent street car fare. The commission points out that it is not clothed with authority to fix schedules of wages, but reports the result of its investigation and says: "Viewing this question from the standpoint of all parties concerned, we believe that the granting of a shorter basic day and a reasonable increase in wages is justified."

The second raise to be granted in one month has been allowed by the Washington Water Power Company, Spokane, Wash., to trainmen in its employ for three years or more. The new wages are retroactive to Sept. 14. The increase is

1 cent an hour for men who have been with the company three years and 2 cents for those who have completed fifteen years of service. The extra men are raised \$5 a month and the minimum salary guarantee for them has been made \$65. The revised schedule allows two-man car employees of three to fifteen years' service 35 cents an hour and the one-man workers 39 cents. Those of fifteen years or more are allowed 37 and 41 cents for two-man and one-man service, respectively.

The 30-40-45 cent wage scale and the eight hour day asked by the platform men of the Portland Railway, Light & Power Company have been granted by the board of arbitration. The new wage scale became effective at once and the eight-hour day is to be put into effect as soon as it can be arranged. The findings of the board will be in effect up to January 1st next and it is hoped by that time means will be found by which the revenues of the company may be increased to keep it in force thereafter. The state public service commission recently refused the request of the company to charge a six cent fare in order to meet these conditions.

Personal Changes

G. B. King has been appointed electrician and telegraph inspector, Pacific System, headquarters San Francisco, Cal.

E. H. Martin is to superintend the construction of the new plant of the Pacific Gas & Electric Company at Fresno, California.

O. M. Hartshorn, formerly secretary at Pueblo, has been transferred to be secretary at the City Light & Water Company, Amarillo, Texas.

E. R. Waite, who was in the general bookkeeping department of the Denver Gas & Electric Light Company, is to be secretary of the Pueblo (Col.) Gas & Fuel Company.

Mr. R. G. Berle of the Los Angeles District Office of the Westinghouse Electric & Manufacturing Company, has recently been transferred to their Chicago District Office.

Mr. Tiltz of the Ilg Electric Ventilating Company is now permanently located as Pacific Coast agent for the above concern and he anticipates carrying a complete stock of fans, blowers, etc. on this coast.

George G. Bowen, assistant sales manager of the Northwestern Electric Company, reports the completion of the new business office of his company, located at the corner of Tenth and Washington streets in the Pittock Block.

The Ward Leonard Electric Company, of Mount Vernon, N. Y., manufacturer of electric controlling devices and vitreous enamel insulation resistance units, announces that it is now represented in Cleveland, O., by Walter P. Ambos Co., The Arcade.

E. H. Sennott, assistant treasurer of the Metropolitan Building Company, Seattle, Wash., for the last eight years, has resigned to re-enter the employ of the Stone & Webster Engineering Corporation, for which firm he will go to France as a financial director.

Mr. Fries, formerly of the Levy Electric Company and later of the Gas & Appliance Company, has become associated with The Electric Shop of M. C. Baker & Sen, San Francisco, and has taken over full charge of all the electric contracting and wiring department.

Charles H. Button of Lebanon, Oregon, has purchased the controlling interest in the Lindsay Telephone Exchange, at Fresno, from A. M. Robertson. Mr. Robertson, who is also secretary of the Lindsay Chamber of Commerce, will move to San Francisco, where he will engage in business.

E. W. Lindquist has been appointed Pacific Coast manager for the Allis-Chalmers Manufacturing Company of Milwaukee, Wis., succeeding Fred L. Webster, who recently became manager of Chicago territory. Mr. Lindquist formerly was sales engineer with the mining machinery department of the company at Chicago.

J. M. Reid, formerly with the O. L. & I. Railroad Company, which operates a 125-mile electric line between Ogden, Utah and Idaho points, has been made superintendent of the

Mount Hood Railroad, with a 22-mile line penetrating the Hood River valley in Oregon from Portland to Parkdale. Mr. Reid succeeds Ashley Wilson.

The notation on the Pacific Coast Agency of the Stanley and Patterson Company made in the Journal of Electricity on October 15, 1917, should read: The Pacific Coast Agency of this company has been placed in the hands of H. B. Squires Company—except Southern California and Oregon which are still covered by R. B. Clapp.

To Increase Output of Coal in Utah

That freight rates on Utah coal to California points are unjust and unreasonable and much higher than the rates on Wyoming coal to Portland, Ore., and that for distance operating expenses and volume of business handled the rates are considerably in excess of those prevailing in other parts of the United States, was the evidence given by F. A. Sweet, president of the Standard Coal Company, before the Interstate Commerce Commission. With his evidence the battle opened of the coal companies against the Denver & Rio Grande and other railroads.

Mr. Sweet testified that the output of Utah mines last year was 3,600,000 tons. He thought the output could be increased to 6,000,000 or 6,500,000 tons if proper facilities were at hand. If the mines were worked to full capacity, he said that about 2,500,000 tons of coal could be shipped out of the state every year.

Great Western Supplies Service for Football Practice

The Saint Mary's football squad is being well worked out by coaches Wilson and Smith for the big game with the Marines at Ewing Field, San Francisco. The coaches have found out that the short time after school is not sufficient to get the boys in tip-top shape for the game, so they have hit upon a novel scheme. In the courtyard of the College lights and reflectors have been installed that give a radiance that is nearly like day. Then in order that the ball may be easily seen during this night practice, it is whitened and so everything is in fine shape.

Western States Gas & Electric Company

Report of gross and net earnings for the Western States Gas & Electric Company for the month of August, shows marked advance over earnings for the corresponding month of 1916. The figures in detail follow together with report of earnings for the year ended August 31, 1917 and 1916:

Month of August—	1917.	1916
Gross earnings.....	\$ 116,849	\$ 97,515
Net earnings	55,428	47,084
Year ended August 31—		
Gross earnings	1,340,331	1,218,887
Net earnings	630,712	581,353

Pacific Gas & Electric Co.

	1917.	1916.
August gross	*\$1,662,202	\$1,494,401
Net after taxes.....	562,033	560,924
Surplus after charges.....	205,265	222,724
12 months' gross.....	*19,922,094	19,080,989
Net after taxes.....	8,081,459	8,325,184
Surplus after charges	3,922,505	4,256,166
Balance after pfd. div.	2,477,181	3,065,825

*Includes sums involved in rate litigation: 1917, \$24,494; August, 1916, \$24,532; twelve months, 1917, \$335,826; twelve months, 1916, \$368,112.

United Railways, San Francisco

United Railroads of San Francisco, a subsidiary of the California Railway & Power Company, reports as follows for the fiscal year ended June 30, 1917:

	1917.	1916.
Gross earnings.....	\$7,458,142	\$7,751,743
Net earnings	2,205,940	2,337,709
Other income	163,121	178,525
Total income	2,369,061	2,576,234
Interest, etc.	2,105,582	2,047,738
Net income	263,479	468,496

An appraisal of the value of the United Railroads' physical properties which has been undertaken by the California Railroad Commission is expected to facilitate the work of representatives of the city and the company who are meeting for a similar purpose.

GOOD BOOKS AND BULLETINS FOR ELECTRICAL MEN

Electrical Appliances and Apparatus

Automatic Electric Faucet Company, San Francisco, Cal., has issued a bulletin in which its circulating water heater is illustrated by drawings and half-tone cuts. In this type of electric water heater there are no coils, and it is of high thermal efficiency, operating on either the 220 or 110-volt alternating current, at capacities of one to 8 kilowatts, according to sizes of electrodes used. In these "Hotwat" appliances the water is heated by electrodes before it passes into the hot-water tank.

A new booklet, No. 370, is now being gotten out by the Esterline Company describing the uses and application of their graphic instruments.

A booklet containing a reprint of H. P. Reed's recent address before the Elevator Manufacturers' Association of the United States on "Unique Features of Electric Elevator Control" and a collection of useful tables on motor equipment has been issued by the Cutler Hammer Manufacturing Company of Milwaukee, Wisconsin.

The American Heater Company under the title of Bulletin No. 40 has issued a 32-page description of their electric heating devices and appliances with a revised price list.

A new folding booklet gotten out by the Hotpoint Electric Heating Company advertises a variety of its wares—and repeats the offer of the Hotpoint Mission Art Supply to dealers.

Miscellaneous

The Mining Division of the Safety Department of the Industrial Accident Commission of California in Bulletin No. 8 lists the accidents among mining men in the state. Of the 30 fatal accidents, 2 were electrocutions.

"The Colorado River in its Relation to the Imperial Valley, California" is the title of a report by C. E. Grunsky which has recently been published as Senate Document No. 103. This is the first publication of a report made by Mr. Grunsky several years ago as consulting engineer of the U. S. Geologic Survey.

A series of publications by the Bureau of Mines is now covering various aspects of the coal situation—the prevention of accidents, absorption of gases by coal, etc.

The annual report of the Rockefeller Foundation covers the work of the International Health Board, the China Medical Board and the War Relief Commission. The Foundation has recently established a school of Public Health in co-

operation with John Hopkins University especially designed for chemists, engineers, etc.

To bring about immediate action by American business on the resolution passed at the recent war convention at Atlantic City recommending that each industry form a committee to represent that industry and to serve as a connecting link between it and the government, suggestions are given in a war bulletin issued by the committee of the Chamber of Commerce of the United States co-operating with the Council of National Defense.

The ease with which records may be found and assembled or grouped for comparison marks the grade of efficiency in any filing system. The recent literature issued by the 'Findex' Company offers interesting reading to anyone looking toward the improvement of office methods.

In the conduct of war today engineers play a far greater part than ever before. A census of Mining Engineers, Metallurgists and Chemists has recently been made by the Bureau of Mines and a report of its findings is now ready. (Technical Paper 179, Bureau of Mines.)

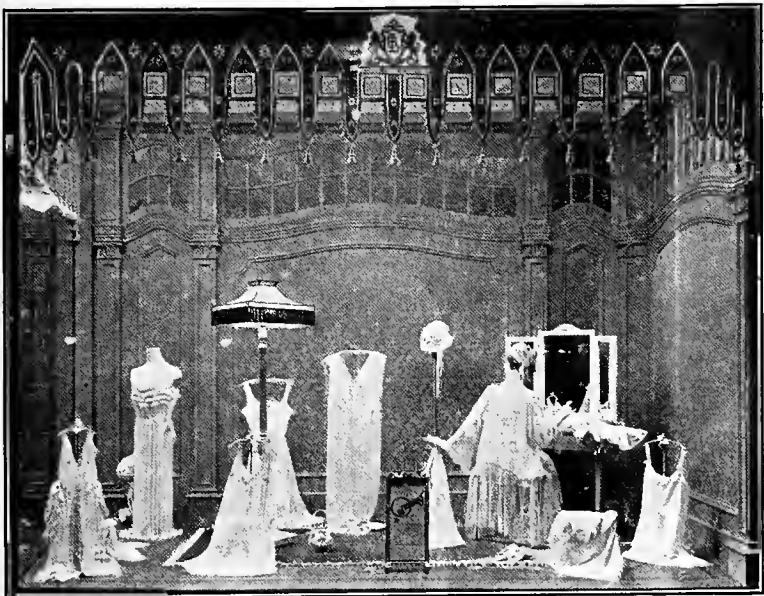
"Mesopotamia—the Key to the Future" is the title of a booklet by Canon Parfit which points out the possibilities of this neglected country which with its rich oil fields and improved transportation offers promising opportunities for the future.

BOOK REVIEWS

Theory and Calculations of Electrical Apparatus

By Charles Proteus Steinmetz, A. M., Ph. D.; size 6x9 in.; 480 pp.; published by McGraw Hill Book Co., New York City and for sale by the Technical Book Shop, San Francisco. Price \$4.00.

The text is designed for the use of the electrical engineer and contains a comprehensive treatment of the numerous apparatus which have found their place in the theory of electrical engineering. The author has covered the important types in common use and also has included many which have not as yet reached any industrial importance but which, with the changes in industrial conditions, may in the future find extensive practical use. In some respects this work may be considered as a continuation of the author's earlier work on "Theory and Calculation of Alternating Current Phenomena," which with its 5th edition has been subdivided into three volumes, of which this forms one. As with the author's former work this book will be found a standard reference in its line.



SUCCESSFUL USE OF THE DAYLIGHT LAMPS

The very latest in window lighting is illustrated here—a bright window with no glare, one that will attract the customer, a clear illumination of all the goods on display in their true colors—this is a window which draws the window shopper from blocks around. The display was a feature of the recent opening of the enlarged Livingston Bros. clothing store in San Francisco.

NEW ELECTRICAL DEVELOPMENTS

(A large pulp mill to be erected in Washington, installations incidental to the electrification of a railroad, new electrical requirements by the growing ship building industry—these are signs of the times. For the greater convenience of our readers the news notes will hereafter be run with reference to the great natural subdivisions of the West.—The Editor.)

THE PACIFIC NORTHWEST

KASLO, B. C., CANADA.—The city electric system will be improved at a cost of \$2000.

SEATTLE, WASH.—Board of Public Works is advertising for a considerable number of miscellaneous supplies for the Lake Union steam power plant.

TACOMA, WASH.—Chicago, Milwaukee & Puget Sound Ry. Co. proposes to construct a \$150,000 power sub-station for its electric line between Tacoma and Othello.

BREMERTON, WASH.—At an election held recently the proposal to purchase the local electric light plant, to be owned and operated by the municipality, was defeated.

EVERETT, WASH.—It is probable that an election will be called this winter to vote on the question as to whether or not the city shall engage in the production and sale of electric power.

OROVILLE, WASH.—Okanogan Valley Power Company has petitioned the council for a franchise to erect and maintain power and light transmission lines over certain alleys and public places.

BAKER CITY, ORE.—D. C. Eccles and associates are preparing to erect an electric transmission line from the terminus of the Eastern Oregon Light & Power Company's line to the Bi-Metallic mine near here.

THE DALLES, ORE.—Plans have been prepared by Malcolm Moody of The Dalles for the construction of a large hydroelectric power project, including dam and power house, on the Deschutes river near here.

TACOMA, WASH.—The City Council of Tacoma has refused the offer of the Tacoma Railway & Power Company to operate the line to the tideflats at cost for two years. The line will be operated by the city of Tacoma.

SEATTLE, WASH.—Puget Sound Traction Light & Power Company has taken out a permit in connection with construction work on its plant on Western avenue due to changing from oil to coal burning equipment.

BURNS, ORE.—E. T. Brusselle has applied to the City Council for a franchise to install and operate an electric-light and power system in Burns. Arrangements, it is understood, are under way for construction of the proposed plant.

PORTLAND, ORE.—Several bonding companies have offered to take up the proposed \$90,000 bond issue which the mayor and the council propose to issue for the construction of a municipal power and water system. The election is expected to be called for Nov. 15th.

INDEX, WASH.—The town council recently awarded the contract for furnishing a generator for the new light plant under construction to the Westinghouse Electric Co. Their bids were: 100 kva. alternator, \$1,067; 3 kw. exciter, \$160; switchboard, \$399; automatic voltage regulator, \$356.

EDMONDS, WASH.—The Washington Coast Utilities Company of Arlington, recently granted a franchise in Edmonds, will begin at once the installation of the local system. The distribution system now in use will practically be rebuilt and arrangements will be made to provide for considerable new business, which will include several small industrial plants.

EVERETT, WASH.—One of the largest pulp mill projects on the Pacific Coast is under consideration for Everett. It is proposed to put in a mill with a daily capacity of 400 tons. The plant will cost \$15,000 a ton, or \$6,000,000. Further-

more, the company proposes to spend about \$3,000,000 on a hydroelectric plant in the Sultan basin, if the plant is located at Everett.

SEATTLE, WASH.—The Cooley Manufacturing Company has been incorporated and will build a factory here for the manufacture of complete marine electric lighting equipment and will supply all Pacific Coast shipbuilders. The plant will cost \$20,000 and will be constructed at 1772 Second Avenue South. George R. Cooley, prominent electrical engineer and contractor, heads the concern.

SEATTLE, WASH.—Mayor H. C. Gill some time ago filed on a hydroelectric power project on the upper Skagit river in behalf of the city. This is to serve as a basis from which private contractors may bid. No bids were received for the proposed \$3,000,000 hydroelectric plant for the city. This is presumed to have been due to the fact that every known power site in the section was controlled or held by private interests.

CORNUCOPIA, ORE.—A 66,000-volt line is to be built from Robinette to Halfway, a distance of 12 miles, for the purpose of delivering a minimum of 200 horsepower electrical energy to the Cornucopia Mines Company here. A sub-station will also be erected in Halfway and a distribution system is to be constructed so that this community may have service for lighting, power and general domestic purposes. The estimated cost of constructing lines and sub-station is \$30,000.

KLAMATH FALLS, ORE.—Two new pumping projects will be started in Klamath county immediately. One is in the Bonanza district where about 17 adjacent ranches will be irrigated. There will be two lifts, one of 30 and one of 50 feet. Water will be taken from Lost river about half a mile from Bonanza. The cost will be about \$11 an acre. C. T. Darley of the reclamation service will have charge. The other will be known as the White Lake project, near Merrill.

KLAMATH FALLS, ORE.—The farmers of upper Klamath County Valley, in eastern Klamath county have determined not to let another season go by without having water on their lands. A total of 1720 acres is embodied in the Willow Creek project, under which ten farmers of that section propose to get water at a low figure. Work is now well along on the dam. The County Court has set December 1st as the date for the hearing of a petition for the creation of an irrigation district in that neighborhood.

KIRKLAND, WASH.—Two power installations have just been completed in the Kirkland district. Three 25 kw. 13,000-volt transformers are being installed at Juanita to serve a 75 h.p. pump motor which is to be used for sluicing between Juanita and Kirkland for a new county road; and two 100 kw., 13,000-volt transformers at the Anderson Shipbuilding yard at Houghton, which has a connected load of 220 h.p. This is the first ship yard on Lake Washington to build ocean-going boats. They already have two ways constructed and expect to have a third completed by January.

THE PACIFIC CENTRAL DISTRICT

SEBASTOPOL, CAL.—The Board of Trustees has accepted the new street lighting plan proposed by the Pacific Gas & Electric Company.

EUREKA, CAL.—Laying of cable for transmission of power and light to Rolph Shipyards and later to the Fay plant has been ordered by officials of Western Gas & Electric Company.

MANTECA, CAL.—The Sierra and San Francisco Power Company is having the small power plant erected for the Manteca refinery of the Spreckels Sugar Company and the foundation has already been laid.

OROVILLE, CAL.—Richard M. Dale of San Francisco has applied for permit to use 750 cubic feet per second of Middle Fork of Feather river for hydroelectric power to be used for manufacturing purposes.

ST. HELENA, CAL.—Sealed bids will be received by the board of trustees up to Nov. 13th, for street lighting of said town for a period of one year from date. All bids are to be made on a flat monthly rate.

OROVILLE, CAL.—J. Sank, of Oroville has applied for permit to use 28 cubic feet per second from French Creek for hydroelectric generating power for mining and manufacture. His plans are to construct a timber crib dam.

RICHMOND, CAL.—The Western States Gas & Electric Company has received an application from the newly incorporated city of El Cerrito for electric service for street lighting purposes and an investigation is now under way.

SAN FRANCISCO, CAL.—The Great Western Power Company of San Francisco is contemplating the erection of an electric-transmission line from Vermont station, near Taylorsville, to the Walker mine, via Genesee mine in Genesee Valley, a distance of 16 miles.

AUBURN, CAL.—It is stated that the Pacific Gas & Electric Company will about the first of the year discontinue the use of the old Newcastle electric power plant. Transformers are to be installed at the Wise power plant in Auburn ravine below this city to take on the Auburn-Newcastle load. The work has been commenced.

STOCKTON, CAL.—The Pacific Telephone and Telegraph Company has appropriated \$59,920 for additional lines and equipment in Stockton and in the Stockton territory, which includes all of San Joaquin county and portions of Calaveras, Stanislaus and Tuolumne counties. New long distance circuits are to be run between Stockton and Sacramento, and between Stockton and Lathrop.

FRESNO, CAL.—As a part of the construction work of the new gas plant for the Pacific Gas and Electric Company a \$34,980 contract with Duncanson-Harrelson Company has been filed in the county recorder's office. The agreement calls for the dismantling of the gas container now at Martin Station, San Mateo county and its erection in the local plant in the Walsh subdivision. The construction is to be completed in five months from date of commencement.

OAKDALE, CAL.—Property of irrigation districts can not be taxed, according to a decision handed down by Judge W. H. Langdon in the suit brought by the South San Joaquin irrigation district to restrain the collection of taxes on its property, known as the Woodward reservoir in Stanislaus county. The ruling is important also for the Oakdale and South San Joaquin irrigation district, which now has pending a dispute with Tuolumne county, which is seeking to collect taxes on the bog Goodwin dam located in that county.

THE PACIFIC SOUTHWEST

SANTA ANA, CAL.—Tustin has voted to form a lighting district as also did Garden Grove.

NOGALES, ARIZ.—The Mountain States Telephone Co. is erecting a telephone exchange building here.

LOS ANGELES, CAL.—The Southern California Edison Company will spend \$2,000,000 in the erection of a 12,500 horsepower plant at Big Creek.

OATMAN, ARIZ.—The Gold Ore mine at Gold Road is being equipped with electrically operated machinery, including a new hoist, a compressor, etc.

BAKERSFIELD, CAL.—The town of Mojave voted 52 to 0 in favor of forming a lighting district. Bids for the lighting system will be opened by the board of supervisors November 5th.

PLACENTIA, CAL.—An election will be held on October 22nd to vote upon the question of establishment of a highway lighting district known as Placentia Lighting District of Orange county.

SAN DIEGO, CAL.—The Board of Supervisors have awarded to San Diego Consolidated Gas & Electric Co. the contracts for the Imperial Beach, Normal Heights and Falbrook lighting districts.

MONTABELLO, CAL.—The board of city trustees has sold a 30-year franchise for oil pipe-line and telephone line across the city, along Cedar and other streets to the Union Oil Company, whose bid was \$150.

SAN DIEGO, CAL.—The San Diego Consolidated Gas & Electric Company has practically completed the electric lighting system for Camp Kearney, which is one of the Government cantonments for the new national army.

LOS ANGELES, CAL.—The Los Angeles Railway Company has been ordered by the Public Utilities Commission to extend its South Park Avenue line from South Park and Slauson Avenue to 61st street and Moneta Avenue.

LOS ANGELES, CAL.—C. F. Mason, commercial superintendent for Southern California Telephone Company has announced that the company will spend \$200,000 to facilitate the consolidation of the Home and Sunset telephone systems in Los Angeles.

EL SEGUNDO, CAL.—At a meeting of the board of trustees G. E. Ward, vice-president of the Southern California Edison Company, made a request that the board advertise and sell a lighting franchise for the city. The matter was turned over to the city attorney for the preparation of the necessary proceedings.

LOS ANGELES, CAL.—F. C. Riley and G. W. Gilbreth of Los Angeles have asked permit to use 20 second feet of San Gabriel river, 15 second feet of Iron Fork and 15 second feet of Fish Creek for hydroelectric power purposes. Plans provide for a tunnel and a six-mile pipe line and equipment for generating 8000 kilowatts. The cost is estimated at \$500,000.

SAN DIEGO, CAL.—The San Diego Consolidated Gas & Electric Company has filed with the Board of Supervisors an application for a franchise to lay gas mains and pipes and to erect poles and wires for transmitting electricity along any and all public highways in San Diego county, outside the limits of incorporated municipalities. Sealed bids for such a franchise will be received up to Nov. 5th.

AJO, ARIZ.—Southern Sierras Power Company will construct an electric power transmission line from Yuma to the mines of the New Cornelia Copper Company here, a distance of 160 miles. The contract calls for the delivery of 2000 kilowatts of electrical energy to the company. The Sierras company recently completed the construction of its power transmission line from El Centro, Cal., to Yuma, Ariz.

LOS ANGELES, CAL.—United Light & Power Company will start work in 30 days on a dam at the mouth of Prairie Fork, in upper San Gabriel Canyon, and on the building of two power plants. The dam will be of concrete of the Eastwood type and 200 feet high, 500 feet at the top and 100 feet at the bottom. The first power plant will have a power drop of 1248 feet and will develop 8000 horsepower. A power sluice will lead from the first plant to the second power house, a distance of six miles. This will have a drop of 1818 feet and will develop 14,000 horsepower. By the construction of 7.7 miles of transmission line it will be possible to connect with any important electric company of Southern California. The cost of the project is figured at \$2,000,000. G. O. Newman is chief engineer.

THE INTER-MOUNTAIN DISTRICT

MALTA, MONT.—Contract for an electric lighting system has been let to George W. Kemper, Minot, North Dakota, for \$39,900.

HAILEY, IDA.—Chas. Peter, president of the Mascot & Terra Mining Company, will install next year an electric light and power plant.

SILVER CITY, IDA.—It is reported that the Idaho Power Company plans the immediate extension of its transmission lines to Deming.

HAILEY, IDA.—Election will probably be called November 15th on the proposed \$90,000 bond issue for construction of power and water system.

OATMAN, ARIZ.—An electric transmission line will be erected to the gold ore mine in Oatman and complete electrical equipment will be installed.

ANACONDA, MONT.—Mountain States Telephone & Telegraph Company contemplates the improving of the lighting system. Cost is estimated at \$35,000.

SALT LAKE CITY, UTAH.—The Salt Lake & Utah Railroad Company, it is reported contemplates the construction of an extension from Salt Lake City to Eureka.

BUTTE, MONT.—City Electrician Roberts suggests a complete reorganization of the city lighting system. He advocates changes of lamps at a cost of \$6500 and giving 47,000 candle power more light.

BUHL, IDA.—The Idaho Power Company starts a power line to Jarbidge which will go south from Thousand Springs plant. It will require 1378 poles, 178,157 pounds of guy wires and \$17,000 worth of insulators.

PLEVNA, MONT.—Stater Brothers of Baker, Montana, have been consulting with the business men of the city on the question of establishing an electric light and power plant here, and have asked for a franchise.

POPLAR, MONT.—M. A. Erickson of Lamoure, North Dakota, will install the new light plant. He has purchased the old plant. It will be a steam plant with a 100 h.p. Corlis engine. The present system will be changed to an alternating current.

GREAT FALLS, MONT.—Electrical Service Company recently opened for business here. The new company solicits only repair work along electrical lines and is catering particularly to the automobile trade. C. A. Luckett and E. W. Kimber are partners in the firm.

TROY, MONT.—The Kootenai Light & Power Company, it is reported, has entered into a contract with the Snowstorm Mining Company by which the latter will furnish electricity for lamps and motors in Troy under a franchise granted by the Council last June. Work will begin on the installation at once.

BUTTE, MONT.—Montana Power Company is rapidly developing into the most important industrial corporation of Montana. With the completion of the Holter hydroelectric plant, 30 miles north of Helena, the company has added another large unit to its power facilities. Construction has been completed but generation of power will not begin until November 1.

DES MOINES, IDA.—The new 13,000-volt line to Des Moines is progressing rapidly. A third wire was strung in on the existing 13,000-volt, single phase line, from Quarry to one and one-quarter miles west of Tukwilla. From this point the existing 2200-volt, Sunnydale-Three Tree Point line was reconstructed and overbuilt with 13,000-volt, three-phase, for a distance of two miles.

DENVER, COLO.—The Colorado Power Company reports that an aggregate of 5,347 horsepower was involved in twenty-three contracts representing new business. The estimated annual revenue to be produced by the business exceeds \$180,000,—about 16 per cent of the company's present annual gross operating revenue. All contracts will become effective during or before next January.

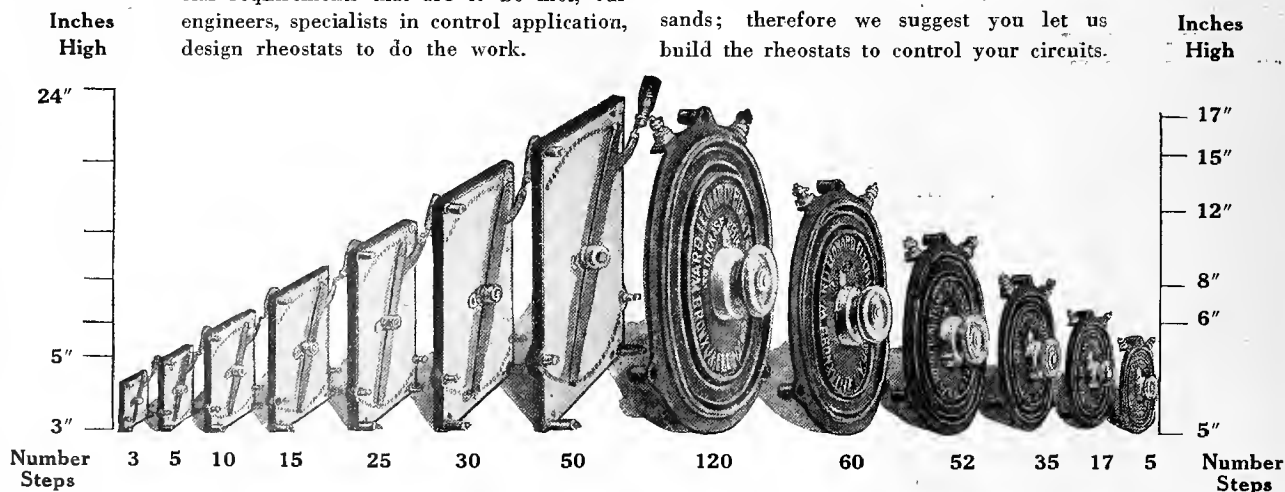
SALT LAKE CITY, UTAH.—Electrification of the Denver & Rio Grande between Salt Lake City and Helper will be undertaken soon after the merging of the road with the Missouri Pacific and the Western Pacific.

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has been our special service. We have experts, engineers who day after day, are selecting from our lines rheostats of standard designs to give the exact control required by our customers. In cases of special requirements that are to be met, our engineers, specialists in control application, design rheostats to do the work.

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JOURNAL OF ELECTRICITY

VOL. XXXIX No. 10 SAN FRANCISCO, NOVEMBER 15, 1917 PER COPY, 25 CENTS

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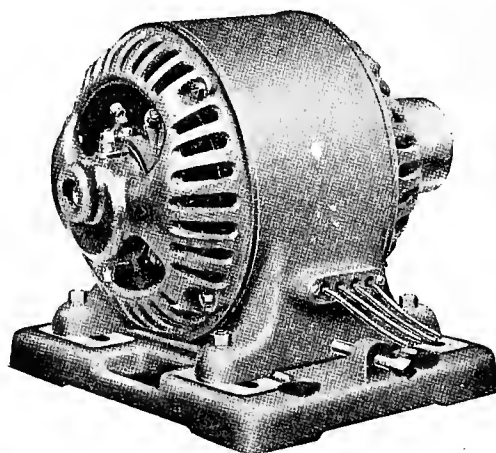
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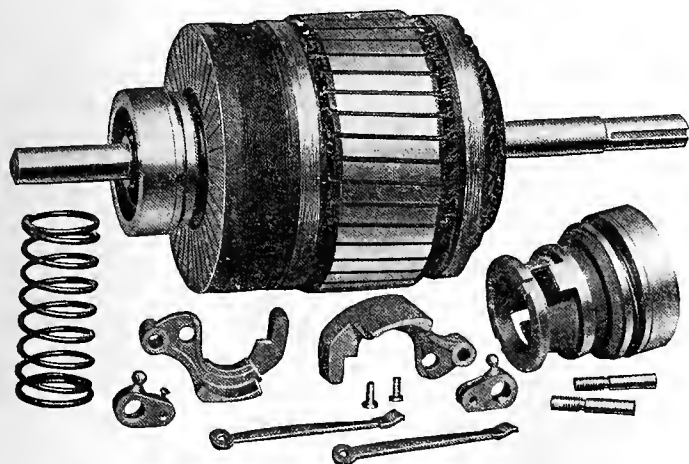
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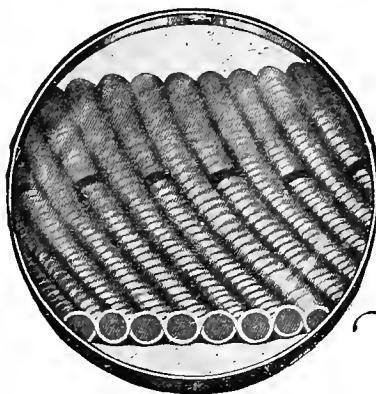
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VOLUME XXXIX

SAN FRANCISCO, NOVEMBER 15, 1917

NUMBER 10

Contents

NEW INDUSTRIAL RECORDS ON THE PACIFIC COAST—by <i>Clotilde Grunsky</i>	440
A factory which is unique in the detail and delicacy of the processes involved—the assembling of electric lamps, an industry which has developed to considerable proportions in the West.	
MEASUREMENT OF ELECTROLYTIC CORROSION—by <i>B. A. Williamson</i>	443
A system of direct measurement which is free from the errors due to the use of new metal in the testing of already corroded pipe.	
CURRENT RATE FIXING PROBLEMS—by <i>C. E. Grunsky</i>	450
The public utility should derive some benefit from the prosperity of the community which it helps to create irrespective of the amount of capital invested.	
RECENT ADVANCES IN WESTERN WATER LAW—by <i>A. E. Chandler</i>	451
The Jurisdiction of Public Utility Commissions, Police Power in Preventing Waste from Artesian Wells, Appropriation of Water Apart from Land, Rights of the Riparian Owner for Supplying Water to Railroad Engines, and Change in Point of Diversion.	
NEW LAMP USES.....	456
The passing of the flashlight in indoor photography and the substitution of the 500 watt Mazda lamp—a suggestion of new trade for the electrical dealer.	
RELATIONSHIP OF THE CENTRAL STATION TO THE CONTRACTOR—by <i>W. R. Putnam</i>	457
The central station man justifies the entrance of the central station into retail trade and makes suggestions for better co-operation on both sides.	
DEMAND FACTOR FOR MOTOR FEEDERS—by <i>F. D. Weber</i>	459
Recent curves for the computation of motor feeders at Portland are set forth which should prove helpful in other localities of the West.	
A WOMAN ELECTRICAL DEALER—by <i>Lillian Palmer</i>	465
New ideas as to store arrangement, compensation of employees and business getting by a woman who is making a success in the electrical industry.	
EDITORIALS	437
Thanksgiving; Why the Contractor's Association; The Zone System a Just One; Effective Hydroelectric Legislation in Sight; The Army Behind the Army; American Electrical Trade in China; and the New Journal Service.	
How the West is Helping to Win the War—II. 436 (Frontispiece)	
Transmission Problems in Long Distance Telephony.....	442
Municipal Ownership of Public Utilities in Los Angeles.....	444
Notes on Three-Phase and Ward Leonard Winding Equipments for Mines.....	445
New Rate Basis for Municipal Charges.....	445
Rejuvenating the Mother Lode by Electricity—by <i>W. E. Eskew</i>	446
The Open Door of the Pacific.....	448
The Effect of Water Power Development on Transportation—by <i>John E. Small</i>	452
Gravity of Oils in Fuel Oil Practice—by <i>Robert Sibley and Chas. H. Delany</i>	453
Officers and Executive Committee of the Utah Society of Electrical Contractors and Dealers	458
How to Splice Rope.....	462
The Contractor-Dealer in California—by <i>R. M. Alvord</i>	462
Technical Hints to Busy Men—by <i>George A. Schneider</i>	463
Women in the Industry.....	465
Notes on the Law of Patents—by <i>Wm. K. White and H. G. Prost</i>	468
Sparks—Current Facts, Figures and Fancy.....	470
Personals.....	471
Meeting Notices for Electrical Men.....	473
Builders of the West XVII— <i>Simon Bamberger</i> ..	473
Happenings in the Industry.....	476
Latest in Everything Electrical.....	478
Good Books and Bulletins for Electrical Men.....	479
New Electrical Developments.....	480

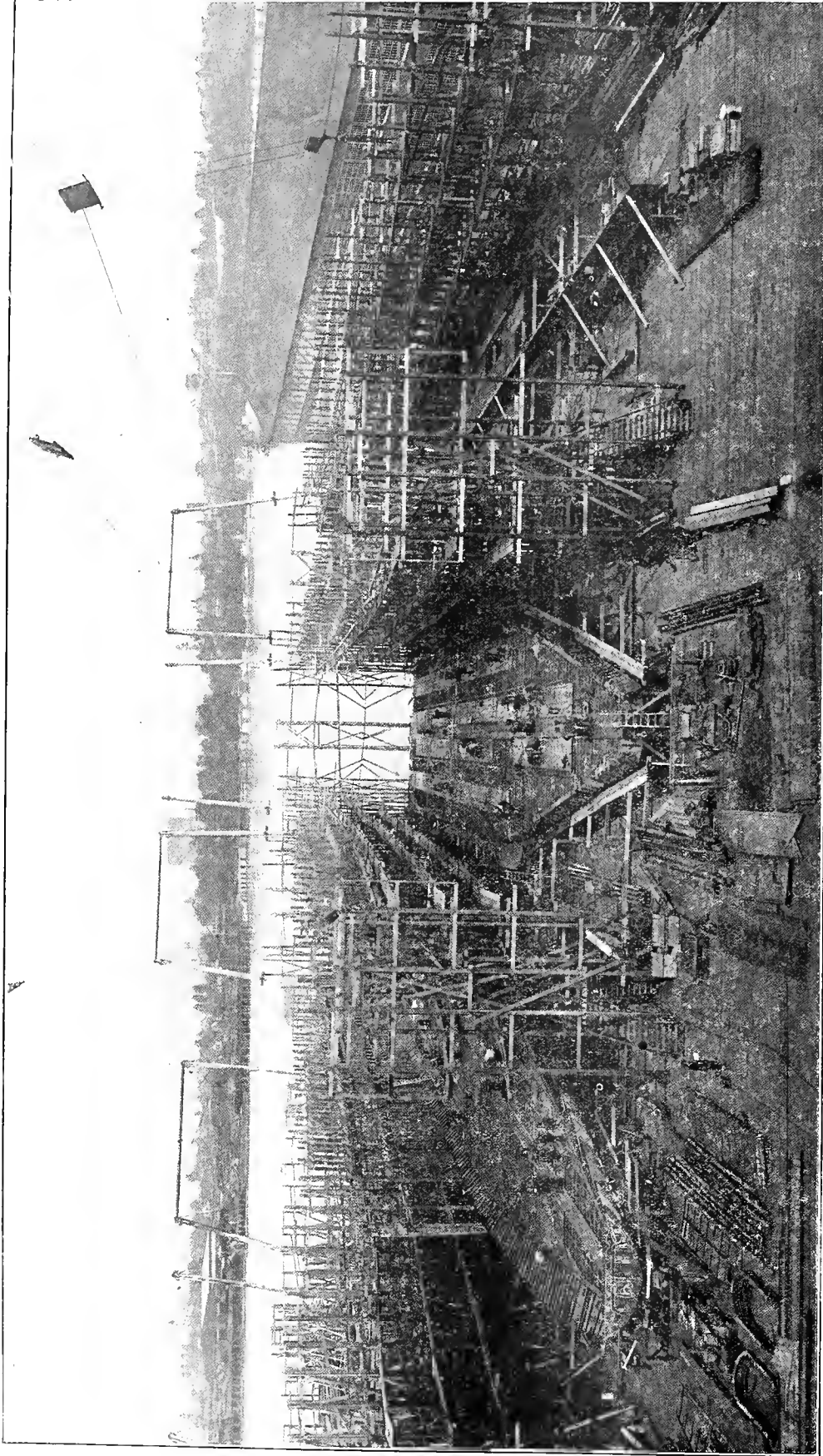
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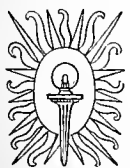
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HOW THE WEST IS HELPING TO WIN THE WAR—II

T

HE unprecedented ship building in the West—an instance of which is shown above from the giant docks along the Columbia—is revolutionizing the industrial and commercial possibilities of this vast region. As a helpful factor in winning the war its possibilities are admitted on all sides. And, when again the soft voice of peace is heard among the nations of the earth, the new industries electrically operated that have been called into existence throughout the West, in order to build these mammoth ships will be so entrenched in the industrial life of the nation as to place this section in the leading position of helpfulness for the upbuilding of the commercial and engineering supremacy of the great Pacific and the countries that line its borders.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

VOLUME XXXIX

SAN FRANCISCO, NOVEMBER 15, 1917

NUMBER 10

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THANKSGIVING



To thoughtful men of the electrical industry, this period of the year has an unusually impressive significance. A great national crisis has arisen and not only have our brothers and sons gone forth to battle, but the subtle thought of a great industry is being brought to bear upon the solution of a world problem in such a manner that effective results are bound to follow. In this hour of national stress can not we all, then, with bowed heads, forget the seeming perplexing problems ahead and recount the numberless blessings that have fallen to our lot during the past year. With grateful hearts let us face the new year. Gratitude may not bring new blessings, but it helps to keep those we already have.

The electrical contractor-dealer of the West is today leading the thought of the nation in this branch of the industry. The present marked activity in every commonwealth of the West, looking to a closer association of men engaged in this field of activity, is to be commended.

Why the Contractor's Association

An electrical contractor-dealer can not afford to be without the helpful ideas and assistance to be derived by mingling with his fellow associates and thus acquiring the combined impetus resulting from the experience of a thousand men daily engaged in the same line of human effort.

There is perhaps no field of endeavor that presents brighter prospects for the future than that of the electrical contractor and dealer. It is simply surprising to see to what a high stage of efficiency men in this branch of the industry are working out their problems.

Let these ideas be coordinated and disseminated among all contractors and dealers and it is indeed difficult to prophesy the possible outcome for increased efficiency.

By getting together, getting acquainted and pushing ahead, shoulder to shoulder, is the only way that this can be accomplished.

Thus only can the highest efficiency be realized in merchandising, in properly advertising, in acquiring working credits and indeed in realizing the success that is reasonably justifiable.

In many respects the contractor-dealer is a public servant, just as the railroad, gas, electric, telephone and other public utility corporations which serve their respective communities.

In view of the difficult problems ahead that must be solved before the unbalancing of the world's affairs

can be readjusted, due to the present world war, and in view of the extremely hopeful results bound to follow by applying the combined experience of a thousand fellow workers, there is but one path open—join the association of electrical contractors and dealers in your community and go in with the zest and enthusiasm that the possibilities of the industry hold for you.

The Zone System a Just One

It is with considerable interest that men of the West have been following the editorial appeals of certain Eastern publications in their loud disapproval of the Zone system of mails recently introduced as a war tax measure.

In brief, this system establishes certain definite zones in which rates for mailing purposes are to be effective, the rate increasing as the distance from the home office increases.

The loudest sounding argument that these papers advance is that the zone system will encourage sectionalism and will tend toward the development of a disrupted or at least of a non-unified national life.

The fact remains, however, that the reverse will be true. Too often has natural expression, trying to assert itself in other sections of the country, been thwarted in its contribution to the nation—an expression that might otherwise prove most helpful and original.

Under the Zone system, that which is of truly worth while value will reach the outermost confines of our national bounds and at the same time encouragement is given to the newer sections of the country to develop ideas and expression that more conservative communities might otherwise thwart. In a word, the Zone system of mails, instead of promoting sec-

tionalism, will have a tendency to revitalize our national life.

Electrical men in the West, in all branches of the industry, were among the first to realize that the day for plotting by groups against other groups in the industry has long since past. Hence it is that co-operation has become the symbol for unified work among manufacturer, jobber, central station and contractor-dealer.

A Proposed Plan for Unified Action

The passing of intrigue, as it may be termed, is in full accord with the spirit of the times. In its last analysis the present great world war of democracy against autocracy is in fact but the struggle for expansion of this same principle of co-operation to an enlarged use so as to embrace all mankind.

So broadcast has this spirit of open-mindedness and shunning of the underhand plotting for the above-board play taken hold of men of the industry in the West, that today another great step forward is about to be taken that will still further advance this policy of mutual helpfulness.

In practically all commonwealths of the West there is current a desire to study the fields of usefulness of all branches of the industry and see how they may be best made to blend one with the other.

Especially are the leaders in thought for the Pacific Coast Section of the National Electric Light Association to be commended for the proposal of the plan whereby a sum of money is to be raised to make a careful and far-reaching study of this problem.

It is proposed to employ a man of the highest educational attainments, one who is familiar with electrical men in this section and who can go out through this territory and study first hand the various problems that are before the contractor-dealer, the central station, the jobber and other branches of the industry. This man, chosen for his tact and for his familiarity with all phases of the problems that now confront the industry in the West, should prove of inestimable service in promoting unified action.

The plan is an excellent one and merits the support of all branches of the industry.

Twenty-five years ago this country was virgin territory to the dealer in electricity and electrical wares. To be sure, he was hampered by the awkward appliances and expensive apparatus of a beginning industry but in spite of

The Last New West

these things, with any sort of business ability, he was bound to succeed for electricity itself carried him with it in its tide of favor. The contractor dealer and the central station man who must today face their problems of competition and overlapping often enough look back upon this period as one of the Golden Days. What if they could start again with the improved product they handle today, with the knowledge they have of its applications and selling qualities?

Of course, it is useless to wish for the impossible and the pioneer days of this country in electrical matters as in others are fast becoming memories. The enterprising men of Europe, however, and to some

extent of our own country have begun to discover that the way to find a frontier is to move to a new land and more and more they have been developing their trade with South America, with the Orient, exploiting new fields with all the advantages of modern methods among a people just awakening to the wonders of an electrical age.

American trade has hitherto confined itself largely to its local opportunities. Capital has not been ready to dare investment abroad, our banks have not developed facilities of exchange nor our government permitted the commercial encouragement of trade combinations which have so materially assisted foreign business elsewhere. With no great degree of regret we have seen opportunities slip by us.

Today we are in a peculiar position. At a day's notice, Germany was withdrawn entirely from competition. England soon found that her capacity was taxed to the uttermost to meet her internal demands. These newer—and older—countries turned to the United States to meet their needs. Not only did opportunities await our trade—they came and asked us to help them out. The records of increased trade with China and Russia, with South America, with Australia and New Zealand are testimonies to the new conditions. The recent action of the government in withdrawing trade investigators from European countries and concentrating on the Americas and Asia is significant recognition of the present situation.

The interesting part of all this is that it is the West which is particularly involved. It is in the countries which border the Pacific that the greatest new developments are awaited—and there is no reason why the electrical manufacturers and dealers of the West should not have a share in the growth. With this issue a review of certain of the current problems and possibilities in foreign trade is presented. It is worthy your study—for opportunity is surely knocking at the Pacific's Open Door.

Notwithstanding the oft-repeated warnings of those who foresaw the danger, the whole country is today suffering from a power shortage. Coal and oil sadly needed for other purposes are being burned to generate steam power while unused water power is running to waste. This is one of the greatest crimes for which posterity will blame us.

Effective Hydro-electric Legislation in Sight

But the past, like the unused water, is gone forever. To deprecate its mistakes is useless except as a means for avoiding them in the future. The need for effective power legislation still exists.

The Shields bill and the new Myers bill safeguard the public interest and provide inducement and protection sufficient to attract private initiative and investment. Their speedy enactment at the December session will do much to relieve the present intolerable situation.

The Shields bill has to do with the development of water power on navigable streams. Its provisions have been discussed so frequently in these columns as to require no further comment now, especially as they

are quite similar to those of the Myers bill which was introduced at the close of the last session.

The Myers bill is an improvement on the Walsh bill, which was designed to accomplish the same purpose, and apparently it has a stronger political backing. It provides for a fifty-year irrevocable lease of the public lands necessary for the development of water power at a rental which "shall not exceed the sum of twenty-five cents per developed horsepower per year for the actual power sold." At the expiration of the lease the Federal government may either take over the entire system, or a severable and complete unit thereof, at its "fair value," or may again lease it, giving preference to the original developer. Half of the money derived from rentals is to be paid to the State within which the power is generated and half to the U. S. reclamation fund. Proportionate charges are provided when only part of the area occupied by the power development is on the public lands.

Both bills represent a compromise. The men who are able and willing to develop the needed power have conceded much more than those who have tried to prohibit such development. Yet it is hoped that enough incentive is left to attract the capital essential to build the dams, power houses and transmission lines necessary to place the water power at the people's service.

The first requisite for favorable Congressional consideration is unanimity of thought and action on the part of the Western people and their Congressional representatives. The question is largely one of Western concern. The West can have what it wants if it will only agree upon what it wants. Consequently everybody should get behind these bills and urge their Congressmen to do likewise.

That the necessary quota of men for the Enlisted Ordnance Corps of the National Army be brought to its full strength is a matter of great importance at the present moment. While in the West skilled men are being developed along slightly different lines from their brothers in the East, still this very fact emphasizes the importance of Western men contributing a just portion to this very necessary branch of governmental service.

Skilled men in a great many different lines of trade are urgently needed at this time as set forth on another page of this issue. Unless the man in the front line trench has the help and skilled co-operation of specialists behind him his work is seriously hampered. Then, too, it is to the best interest of the nation that each man does the work for which he is best fitted, thus saving the government a long period of instruction, and also greatly enhancing his own chances for advancement.

A great many men who are experts in their lines will wish to make a sacrifice for the government and take less pay to become non-commissioned officers in the Ordnance Corps of the National Army. The Ordnance Corps has been called "The Army behind the Army." And the West will never be found wanting in being behind any army that is behind the army of this great nation.

American electrical apparatus is gaining rapidly in popularity the world over. A compilation by the National City Bank of New York shows that the value of electrical machinery, appliances and instruments exported from the United States in the fiscal year 1917 aggregated more than fifty millions against thirty million dollars in 1916 and six million dollars in 1900.

In view of the closer ties that are fast being formed between the allied nations, it is interesting to note that the engineering and commercial relations of all the Pacific neighbors are each day becoming more interwoven and a closer spirit of co-operative helpfulness engendered. Comment has recently been made in the editorial columns of the Journal of Electricity setting forth the rapidly growing relations of this nature with our far eastern neighbors—Japan and China.

Coming to a consideration of our great neighbor immediately to the north, figures just compiled by the Bureau of Commerce are especially interesting.

An examination of these reports reveals the fact that the United States has practically a monopoly of Canada's import trade in electrical apparatus. Out of total imports valued at \$6,342,490 in the fiscal year ended March 31, 1917, the United States supplied \$6,149,342 worth; in the fiscal year 1916 the corresponding figures were \$4,896,106 and \$4,640,096; in 1915, \$6,035,689 and \$5,137,382; in 1914, \$8,924,314 and \$7,505,244; in 1913, \$9,104,540 and \$7,613,567. (In the last-named year the United Kingdom supplied \$1,188,079 worth of the imports.)

While for the years 1913 to 1915 the United States was the Dominion's best customer for Canadian-made electrical apparatus, its purchases during 1916 and 1917 did not keep pace with the expansion of the export trade in such articles.

Thus it is seen that the future holds in store a brilliant outlook for ever-growing closer relations in engineering and commercial matters with all our Pacific neighbors.

And in the contemplation of this fact, it must be borne in mind that only by the everlasting propagation of the co-operative spirit, devoid of domination, can the ultimate goal of peace and mutual helpfulness be profitably set up among all our Pacific neighbors.

THE NEW JOURNAL SERVICE: The current problems of the electrical industry in the West are largely concerned with those of the contractor-dealer. It is with unusual pleasure that announcement is here made of a series of papers that are to appear in the columns of the Journal of Electricity under the authorship of Albert Elliot, the well-known attorney of San Francisco. Mr. Elliot has in recent months proven an able analyst of problems in the electrical industry throughout practically every commonwealth of the West. Indeed in nearly every electrical convention of the current year he has been assigned the leading place at the banquet program. The series will begin with the issue for December, 1917. His terse discussions of credits, of merchandising relations with the central station, of law with reference to the contractor-dealer, and a dozen other subjects should prove of timely interest to men of the industry throughout the West.

A new Service Department has been established in offices of the Journal of Electricity for the convenience of those who have inquiries to make, and all questions, reports of any mistake in address or delay in delivery, matters of employment, and the like, should be addressed to this department.

NEW INDUSTRIAL RECORDS ON THE PACIFIC COAST

BY CLOTILDE GRUNSKY

(Electricity continues to play the leading role in the marvelous commercial and industrial growth of the West. First came the giant power plants, now follow industries in electrical manufacture that are surpassing in wonder and efficiency accomplishments hitherto attained. Men in every branch of the electrical industry, desirous of keeping abreast of the times, should familiarize themselves with these new and interesting records. Take the lamp manufacture as an instance. Do you know that your customers are wondering how they managed to get the wire inside a 'bulb' whose base is too small to receive it, how the vacuum on the inside is achieved, how it is possible to make anything as fine as a tungsten wire? The marvel of these things is to be explained by a visit to the Oakland Mazda Lamp Division of the General Electric Company—but only to be succeeded there by new wonder at the successful handling of the extremely delicate processes.—The Editor.)



THE BUTTON MACHINE

Fine point gas flames are used throughout where the glass must be heated and molded to shape. This machine measures the stems and forms knobs at the top and bottom.

the development of many subsidiary works to supply electrical machines and products necessary to the process. New processes and demands are giving rise to new factories particularly along the coast from San Diego to British Columbia.

Not the least important of our electrical industries is that involved in the great mazda lamp divisions of the General Electric company. The metal ingredients, glass globes and raw material of the process are the product of factories in the east, none of this work being done west of St. Louis—but there are 16 or 17 establishments in different parts of the United States which handle the assembling of these lamps, more truly the manufacturing part of the process. One of the largest and most efficient of these is the Mazda Lamp Division of Oakland.

To any one used to factories which handle great bars of steel or heavy timbers, this will seem an entirely different sort of an establishment—hardly a factory at all in their sense of the word. And indeed the great interest of the works lies in the extreme delicacy of the problem. The handling of the fragile glass containers through heat and cold, the wiring of the lamp with a filament so fine that it would take at least two of them to make the thickness of a human hair, the managing of all this with a more or less changing corps of workers without a breakage bill which would preclude all hope of profit—the solution of such problems as these makes the record of a successful establishment such as that of the Oakland division a history of real achievement.

There is hardly an industry which is its parallel

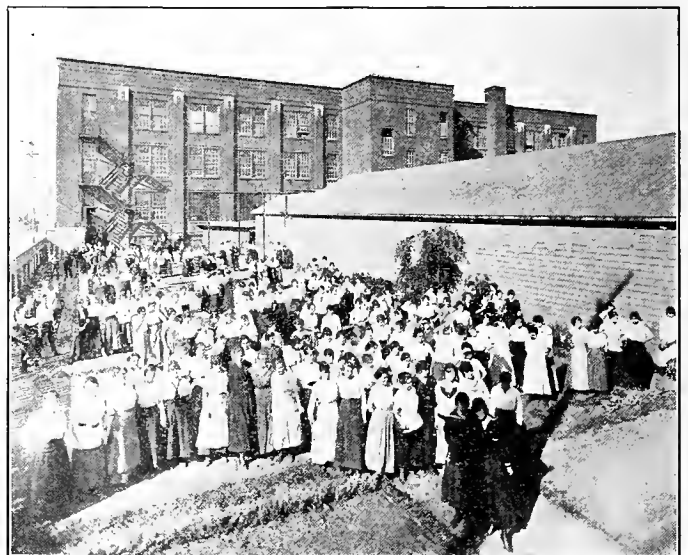
WITH its various world records in dams and power lines, the West may fairly be said to be the great center of electrical power development in this country. We have hitherto been willing to grant the great achievements in the manufacturing side of the industry to the East—but with the recent impetus along all lines of work and the particular advancement in electrical needs, the West is coming more and more to the fore. The growing ship building industry has fostered

in the sureness and delicacy of touch required. In contrast to the physical strength and mechanical skill demanded of the usual factory worker, the need here is for quickness, deftness, nicety. It is not surprising therefore that of the 300 or more employees, about 250 are women. Indeed, aside from the managing and supervising (of which women also have some share) the entire process is in women's hands except for the repairing of machines, loading of trucks and heavy mechanical work.

Many steps are involved in the actual process of assembling a lamp. The glass globes, which form the basis of the product, arrive in large cartons from the east and are first unwrapped, placed in racks, washed and dried as a preliminary step. Grease and other accumulations are removed by a dip in a dilute solution of hydrofluoric acid—and then a final bath in fresh water renders the bulbs ready for use.

The first step in the actual manufacturing process consists in the preparation of the various parts which go to make up a lamp. Glass tubing of varying sizes is used to make the base on which the filament is supported, the central shaft and later also in the last process of exhausting the air. This is now cut on an emery wheel into the desired lengths—a very exact process which requires long practice and skill in handling.

The larger of these tubes is next passed on to a 'flange' machine which heats the lower end of the tube and spreads it mechanically into a flange, later to fit



THE MAZDA LAMP WORKS OF OAKLAND

Owing to the extreme delicacy of the operations involved, the work is done almost entirely by women. The new factory is now being erected on the site of the garden shown here and a new garden is being planted.

into the base of the lamp. The greatest skill is required in the adjustment and handling of such machines as the slightest defect in the glass, although not apparent at the time, may later cause the discarding and wastage of the lamp in the last process.

Long strips of the cane glass are converted in the next process into the central shaft of the lamp by a "button machine" which by the application of heat and pressure, mechanically forms 'buttons' at top and bottom and cuts the glass into the desired lengths.

The process of stem making combines these two with the insertion of the lead-in-wires. When it is realized that the delicate

glass and wire parts must be re-handled two or three times to each process and this at great speed, the magnitude of the problem is begun to be realized. The workers on some of the more complicated processes have attained records of 5000 lamps a day.

The "spidering" machine is the next to take up the lamp. This work of adding the hooked arms at the top and bottom of the stem which are later to support the fine tungsten wire was formerly done by hand

but a machine has now taken over the more delicate parts of the work. It must be remembered that machinery is continually being improved along these lines. Mazda lamp manufacture is young in the years which it can number, but old in the stages of improvement through which it has already passed.

The wire used for these supports is itself tungsten but of a heavier grade. The size of wire used of course varies for the different types of lamps, the smallest used being that for the 10 watt lamp, which is something like half the size of the proverbial hair line. Diamond dies are used in its production, actual diamonds of large size and first quality being drilled with minute holes through which the wire is drawn. As the diamonds wear they are advanced backward in the process so that the wire at each stage passes through a smaller and smaller hole until its proper dimensions are reached. Although tungsten has something like twice the tensile strength of steel, of course a filament as fine as the one in use requires careful handling which makes the next stage of wiring a particularly delicate one.

Up to this point the wire which was received in spools of the pure metal has been run through a chemical solution, dried and wound on short spools where it is measured and weighed to see that it is of the proper size to use with the lamps in question. A slip here or failure to check the wire used might cause a loss of hundreds of dollars in a few hours. So precise are the motions needed here that particular attention

is given to the selection of small girls the movements of whose hands are not so sweeping as those of their taller sisters.

This completes the filament portion of the lamp. The bulb in the meantime has had a small tube welded to the rounded end which later is to be used to exhaust the air. At this stage the two are combined. The bulb is broken off at the proper point by the application of heat at the desired spot and then cold. With great care this is then placed over the filament and the two welded, thus hermetically sealing one end. It is at this point that the base is narrowed to its familiar size.

It is now necessary to exhaust the air and this is done by a mechanical exhaust which raises the temperature in the oven to about 560—600° Centigrade. The effect of the heat in expanding the air and driving it out of the tube outlet combined with a suction applied at the same point at successive stages establishes an effective vacuum. From the last position the projecting tube is annealed and broken off close to the bulb, sealing the lamp completely.

The lamp is now complete but must further pass through an aging process—partly achieved by a machine which runs the lamps from low to high voltage and partly where necessary, by burning on 'aging' racks.

The testing laboratory next establishes the effectiveness of the product mechanically and puts it to the test of amperage and voltage. A photometer is here used in which the image of a standard lamp and of the one to be tested are thrown upon the screen. From the color and intensity, it is possible to determine if the product is standard. A volt and ammeter connected furnish a further check. If the incorrect wire filament should happen to be used it is here that it is detected.

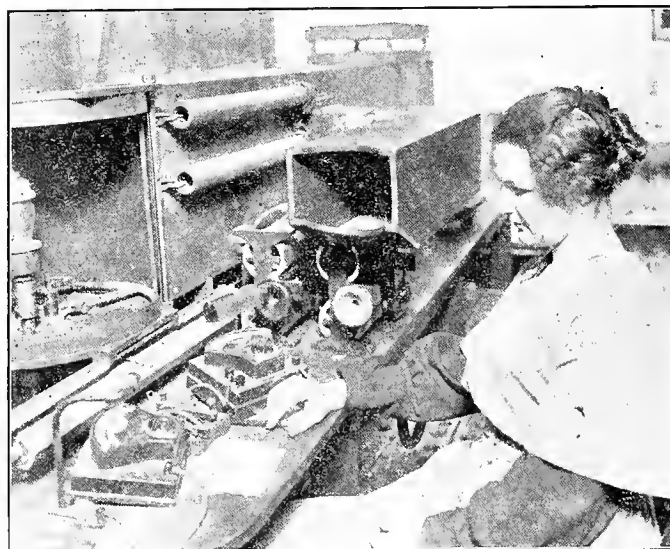
The only remaining process is that of attaching the metal bases. This involves the proper fitting of the wires and the cementing and baking of the parts.

From this stage the lamps are again inspected for some 50 different defects which may creep in, labels



WINDING THE TUNGSTEN WIRE

The wire is wound on flat spools which bend it at the proper points to later fit exactly on the stem supports. All of it is finer than the thickness of a human hair.



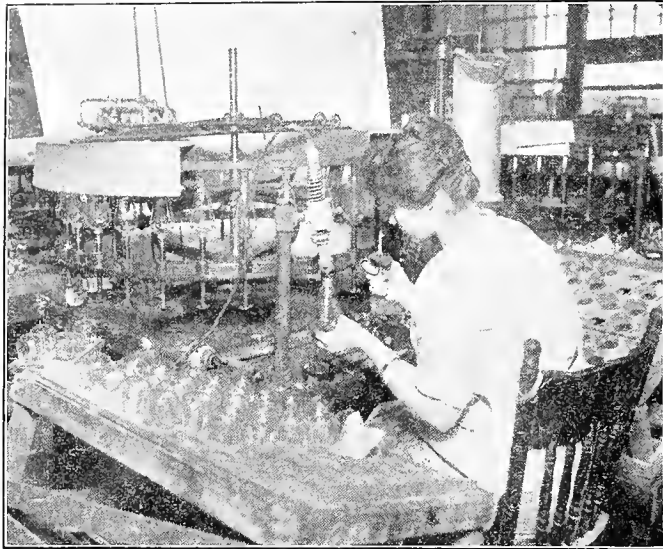
PHOTOMETRING

In testing the lamps a photometer is used together with a volt- and ammeter. This insures the lamp being that which its label proclaims for it.

are pasted on giving wattage, etc.—and the finished product is placed in its wrapping.

It now remains only to box and ship them to the waiting jobbers.

The great problem of the industry, of course, is the reduction of the breakage to a minimum. With this in mind, it is obvious that even a normal turnover in help must mean enormous loss. A new worker



ATTACHING THE BASES

The last process in the manufacture of a lamp. The globe itself is complete by this time, but for commercial purposes the metal base is added.

not only breaks the work handled or turns out imperfect results but also is to be held responsible for the loss which results from her lesser output.

The Mazda Lamp division, however, is fortunate in keeping their help. A most extensive Service Department under the direction of a trained nurse who has complete supervision of the women's interests, provides lunch rooms, rest rooms, medical attention and other conveniences. Cases of sickness are visited at the home, small troubles treated in the model dispensary. The lunch room where a warm lunch is served at a very small cost now seats some 210 and is later to accommodate the entire staff. A piano, a library and a complete set of magazines make the large and attractive rest room a place of real pleasure. There is an ukelele club and a rowing crew among the women—and informal entertainments are encouraged. A full half floor is devoted to this department and in the new building soon to be erected, even more comfortable quarters are to be allotted to it.

TRANSMISSION PROBLEMS IN LONG DISTANCE TELEPHONY

Some of the more important of the problems of transmission to be overcome on a long distance telephone line are pointed out by Bancroft Gherardi of the American Telephone and Telegraph Company in a recent paper, extracts from which are here given:

The long distance telephone problem is largely a line problem. One step in improving the efficiency of a long line is to add to it at suitably determined intervals specially designed induction coils known as loading coils. On the New York-San Francisco line

there are about 400 such coils spaced at intervals of about eight miles. These coils diminish the losses in the circuit to such an extent that it will deliver at the receiving end about one-millionth of the energy put in the circuit at the transmitting end. This proportion of received energy is still far below that needed for commercial service.

Further improvements have been made by associating with this line intermediate apparatus known as telephone repeaters and capable of receiving an enfeebled electric current and putting into the line a new electric current derived from a separate source of energy and controlled by the enfeebled received electric current, so that the new current possesses the same characteristics in regard to shape but is greatly magnified. Thus it is possible to receive at the distant end of the circuit energy equal to one-eightieth of that placed upon the circuit at the transmitting end and thereby give good commercial service.

There are many other problems in connection with this line which can not be touched upon within the limits of a paper such as this, but a few may be mentioned. This line is equipped with about 300,000 insulators. Loss of energy must be guarded against at each of these points. For various reasons it is necessary to insert in this line a number of transformers, or, as they are usually called by telephone men, repeating coils. To properly handle the high frequency telephone currents and to make from time to time the necessary changes in impedance, that is the ratio of voltage to current, the telephone transformer problem has been carefully worked out so that there are available for use suitable transformers of high efficiency. To meet the practicable operating conditions and to enable the line to be used, not only at its terminals, but from intermediate points, the line is switched at a number of points where it passes through telephone switchboards. At each of these points the switchboard apparatus must be designed with the utmost care to reduce the losses to a minimum.

Under many conditions it is necessary to place telephone lines in cable. At the present time there is working in the plant of the Bell Telephone System a cable almost 500 miles long extending between Boston and Washington and connecting these places together and with New York and Philadelphia and other important places. By the addition of suitably connected repeaters the efficiency of this circuit 500 miles long is rendered such that one-tenth of the transmitted energy is received, or a very high grade of telephone transmission is given.

Since the telephone receiver is so sensitive it is necessary that arrangements shall be made so that there will not be induced upon the telephone circuit even minute currents from outside sources. Such disturbances are of two general classes:

The first is that which may arise from the induction between one telephone circuit and another.

A second class of disturbance that must be guarded against is that arising from electrical circuits rendering other services, of which electric light and power circuits are typical. The problem of protecting the telephone circuits, particularly open wire circuits, from such disturbances is one of the greatest magnitude.

MEASUREMENT OF ELECTROLYTIC CORROSION

BY B. A. WILLIAMSON

(Electrolysis, working in obscure corners and making destructive inroads in pipe and tanks where least expected, still continues to perplex men of the electrical industry throughout the West. Here is an excellent article on this subject by an author engaged in research on electrolysis who is with the Los Angeles Gas & Electric Corporation. This corporation under the direction of E. R. Northmore, superintendent of distribution, is to be congratulated upon the undertaking of research problems of this nature, the results of which must ultimately prove of so much value to the industry.—The Editor.)

The electrolysis inspector, who is asked to make an examination of a corroded pipe line and an electrolytic survey of the district for the purpose of reporting upon the character and the extent of the corrosion, has a difficult task. The effect of vagrant electric currents in producing corrosion is much the same in appearance to soil corrosion, which is practically always present to a greater or less extent. It is sometimes extremely difficult to determine which of the two factors exercises the greater corrosive effect. Another difficulty lies in the fact that electrolysis engineering has but recently come into prominence, and therefore has not been reduced to a scientific basis.

The writer has experienced these difficulties and wishes to present a method of making this class of measurements which is new and possesses certain advantages over those methods described in current literature on the subject.

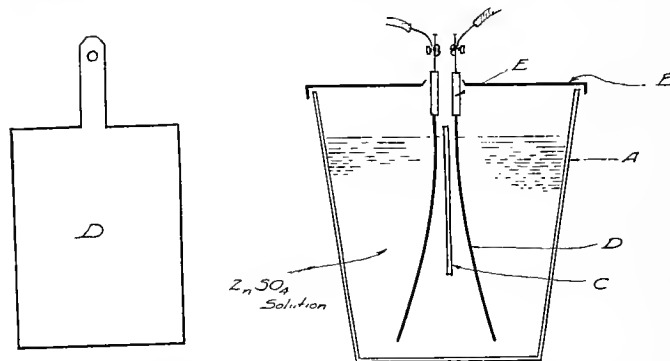
In a recent technological article by an eminent authority there is described one method of testing, which briefly stated is as follows: After carefully cleaning and weighing two specimens of iron, place them in the soil adjacent to the pipe line under investigation. Connect one of the specimens to the pipe line with a wire. Thus this specimen will be subjected to both soil and electrolytic corrosion and the other specimen will suffer from soil corrosion only. At the end of a reasonable period, remove both specimens and clean of all products of corrosion by a specified electrolytic process, after which re-weigh the specimens and determine the loss of each in per cent. The difference in the loss of the two specimens is ascribable to electrolysis of the vagrant current and the loss of the specimen not connected to the pipe line is that of soil corrosion.

While this method is unique in being the first, so far as the writer knows, of making direct measurement of the rate of electrolytic corrosion of pipe lines, it appears to have certain disadvantages and sources of error. A disadvantage that may be cited is that considerable time, say three months as a minimum, is required to complete a test for the amount of metal corroded in a time of less than this would be so small as compared to the initial weight of the specimen, that any small error in cleaning or weighing would materially affect the result of the test.

A source of error lies in the assumption that the rate of the corrosion is independent of the ratio between the surface and the volume of the specimen. Evidently the specimen of iron in question that must be weighed on a delicate balance will lose much more rapidly in proportion to its weight than will a pipe of commercial dimensions. It has been stated incidentally that a needle will survive soil corrosion only a few weeks. Another source of error is due to the

galvanic effect that is experienced when two pieces of metal, dissimilar in composition, are electrically connected and placed in an electrolyte such as the earth. Thus it will be found that there will exist between the pipe line and buried iron specimen a certain galvanic potential, depending upon the dissimilarities of the composition of the iron, soil and the character of contact between soil and iron.

In order to reduce the time required for making a test from three months to as many days the above method was modified as follows: Take a new pipe



ELECTROLYTIC CELL FOR USE IN TEST

A jelly glass and two electrodes of sheet zinc form the basic materials for the test. Errors due to difference in surface area in comparison to volume and difference in the actual composition of the pieces tested are otherwise compensated for.

2½ in. x 18 in. and drive in soil near the pipe line under examination. Construct an electrolytic meter, consisting of two zinc electrodes immersed in a solution of zinc sulphate. Connect one of the electrodes to the pipe line and connect the other electrode to the pipe used as a specimen. Ignoring galvanic effects, if there is electrolysis present due to vagrant current, it will flow through the cell, electrolyzing the corresponding electrode to be discharged from the specimen to the soil. If the pipe line is absorbing current from the soil, it will be discerned by the other electrode being electrolyzed. The quantity of electricity in ampere-seconds that passes may be calculated by weighing the electrodes at the beginning and the conclusion of the test and multiplying the loss in grams by 2967 according to Faraday's Laws. The loss of iron of the specimen in grams may be approximated, assuming an efficiency of corrosion of 100%, by dividing the ampere-seconds by 3445.

In this method, unlike the previous method, there will be no negative result when the pipe is absorbing current. It permits the use of a specimen of size comparable to the practical requirements of the test. It is much easier to wash the dissolved metal from the zinc electrodes than it is to electrolytically remove the oxides, without removing any metal, from the iron specimens. The zinc electrodes are small, weighing

about 10 grams and therefore the loss of one gram would mean a 10% loss, which would be appreciable to the eye. It would be feasible to have electrodes of standard size, which after being used in a test could be filed away, as are meter charts for future reference.

The electrolytic cells may be made at a slight expense in a convenient form as follows: A is an ordinary jelly glass with a tin cover B, in the top of which is cut a slot through which is suspended two electrodes D made of sheet zinc. These electrodes are immersed in a 20% solution of zinc sulphate and are separated at the lower end by a partition of glass C which is cut to fit a central vertical section of the jelly glass. The upper ends of the electrodes are insulated from one another and the cover B by short sections of rubber tubing E. At the upper end of the electrodes the number of the cell is stamped and holes drilled for the insertion of tiny brass bolts by which connection is made to the wires.

Unfortunately this method does not eliminate the error due to the galvanic potential existing between two dissimilar metals immersed in a common electrolyte. To determine the extent of this error, a short pipe was taken from the scrap heap and cut in the center; one end was filed bright and after burying both ends in moist soil, it was found that the rusty end was positive to the bright end .17 volt. At the end of 24 hours this potential had fallen to .04 volt. It will be noticed that the direction of the flow of current was from the rusty pipe through the volt-meter circuit to the bright pipe and in the soil it was from the bright pipe to the rusty pipe. Thus two dissimilar metal specimens, when in contact with a common electrolyte will show a galvanic potential difference of a polarity, such that if the specimens are connected the direction of the current flow will tend to equalize the potential differences.

Judging from the above experiment, the reader might conclude that if the specimen was allowed to remain in the soil for a few days, connected to the pipe line with a wire, the galvanic potential difference would be entirely eliminated, after which a reliable test could be made by inserting an electrolytic cell in the circuit. It was proven that this is not the case by the following manner: A location was selected in an electrolytic field of two car lines near the end of the street where the pipe-line was dead-ended. It was assumed that if the current flowed away from the substation supplying the car lines and toward the dead end of the pipe line, that electrolysis was occurring since the current must be discharging from the pipe line to the soil and vice versa, if the current was flowing in the opposite direction, the pipe line must be absorbing current from the soil. The direction of the current flow was observed by taking the potential drop over the pipe line by means of a Bristol recording milli-volt meter. Short iron pipes were driven in the soil for test specimens and connected to the pipe line through the electrolytic cell, which indicated the direction and quantity of current discharge. After making a number of these check tests, the writer concludes that in cases where electrolysis due to vagrant current is occurring at a relatively slow rate compared to soil corrosion, erroneous results may be obtained by measuring the loss of weight of an unseasoned specimen

that is electrically connected to the pipe under examination.

It is believed that a more reliable test could be made by using a disconnected portion of the underground system for a specimen. Thus it is nearly always possible to find a vacant building whose service pipe may be disconnected at the main and at the meter. It would seem that the disconnected service should possess all the desirable points of a specimen. It should be almost entirely free of galvanic potential differences since presumably it is of the same quality of iron as the system of which it is a part, it should have the same amount of surface corrosion and the soil surrounding it should have the same quality and quantity of oxides and gases in solution. By connecting the service to the main through an electrolytic cell, a measurement of the direction and quantity of current could be made in a few days after which the service could be re-connected. Another method would be to insert an insulating coupling in the pipe line near a dead-end after which the electrolysis on the insulated dead-end could be measured by connecting the cell in a jumper across the insulating coupling.

MUNICIPAL OWNERSHIP OF PUBLIC UTILITIES IN LOS ANGELES

(The question of the municipal ownership of public utilities is not one to be lightly decided. Without here commenting on the arguments as presented, the following excerpts from the report of the committee on municipal ownership of the City Club of Los Angeles are submitted as containing matter which must be of interest to both sides.—The Editor.)

In a report on the "Government Ownership of Public Utility Service Undertakings," the committee of that title of the City Club of Los Angeles recommends:

1st. The completion of the purchase, and the development of the required equipment for the entire city electric service;

2nd. Complete the purchasing of all of the remaining water companies;

3rd. Take over, with the least possible delay, the entire equipment of the Los Angeles Gas and Electric Corporation as well as all other gas supplies in the city.

Comparison of American, Great Britain and German Cities

In the 56 largest American cities, the 50 largest cities in Great Britain and a like number in Germany, the public ownership of Water, Gas and Electric supplies in number and per cents are as follows:

OWNERSHIP OF THREE LEADING SERVICE UTILITIES									
Country—	No. of —Water—		—Gas—		—Electric—		—Total—		P.C.
	Cities.	No.	P.C.	No.	P.C.	No.	P.C.		
Great Britain...	50	39	78.	21	42.	44	88.	104	69.3
Germany	50	48	96.	50	100.	42	84.	140	93.3
United States...	56	49	87.5	1	1.8	7	12.5	57	33.9
Totals* and %	156	136	87.2	72	46.1	93	59.6	301	64.3
*Total number of utilities for all cities 468.									

Ownership of water service by American cities is well established, as 49 of the 56 cities, or 87.5%, now own their supplies. This is $\frac{1}{2}\%$ higher than the combined average for the 100 cities in Great Britain and Germany.

All of the 50 German cities own their gas supply while only one of the 56 American cities owns its supply.

Ownership of electric service shows that Great Britain cities own 88%, German cities 84%, while the 56 American cities stand at 12.5%.

The total average ownership of these three utilities show that the Great Britain cities own more than double the per cent of American cities, while the German city ownership per cent is nearly three times as much as ours.

NOTES ON THREE-PHASE AND WARD-LEONARD WINDING EQUIPMENTS FOR MINES

The relative advantages of the Ward-Leonard and three-phase systems of electric winding have been discussed before the South African Institute of Electrical Engineers several times and the broad principle has been established, as set forth in the recent proceedings, that either system may have advantages over the other according to the conditions of the wind. So far, the author believes, no attempt has been made to state definitely the limits between which the three-phase system has advantages over the Ward-Leonard and vice-versa.

It is generally acknowledged that the Ward-Leonard system gives cheaper operating costs under plain cylindrical drum-hoists hauling from 3000 ft.

With the three-phase equipment the present limits of the contactor switches limit the size of equipment when it is desired to install about 2000 h.p. at 2200 volts. This is much too small for many of the deep level winding problems that have to be solved on these fields.

Generally speaking, the three-phase equipment will be found economical on straight-forward winds of moderate depths and weights. This holds for Rand conditions where the rope is in general discarded when the factor of safety is reduced to six. For incline shafts the limit of depth will be much greater and will depend upon the angle of inclination.

For greater depths than 3000 ft., probably up to 4000 ft., there will not be much to choose between the two systems, and above this depth the advantage will be with the Ward-Leonard equipment. The reasons for this are, firstly, the unbalanced pull on the drums becomes very great with great depths, needing a large accelerating peak, and, secondly, when nearing the end of the wind the unbalanced pull of the rope is more than enough to pull the skip to the surface and the winder will require reverse power to bring it to rest. Reverse power with a three-phase equipment meaning extra energy from the line, with a Ward-Leonard it will mean energy returned to the line.

For shallow winds up to, say, 1000 ft., the proportion of accelerating time is very large, and it becomes possible to save a large percentage of the power consumption by using a Ward-Leonard equipment, in general sufficient to compensate for the extra capital that is required to install it.

NEW RATE BASIS FOR MUNICIPAL CHARGES

(Here is how the small city of Glendale in Southern California is solving its municipal rate problem. The establishment of a service charge designed to cover the cost of handling a customer's business—the cost of maintaining the service, reading meters, billing, and collecting—constitutes a problem that has perplexed rate fixing bodies throughout the West. The unique departure in this regard in this Southern California city will be watched by men of the industry throughout the West with unusual interest.—The Editor.)

The new rate for the city of Glendale is a complete departure from the usual form of rate inasmuch as they have established a service charge. This is a fixed charge designed to cover the cost of handling a customer's business; that is the cost of maintaining service, reading meters, billing, collecting, etc. This service charge is 50c per month for single-phase current, energy is then charged for at the rate of 2c per kilowatt hour for the first 100 kilowatt hours, and 1c per kilowatt hour for all in excess of 100 kilowatt hours.

There are no restrictions in connection with this rate. Single-phase electricity is sold through one meter for all purposes including light, power, cooking, local heating and water heating at the above rate. It has always been the idea of the Department to avoid complications that result from special limitations, double throw switches, cooking rates, etc. Practically the entire territory is served with gas at 68c per 1000 cubic feet. To fairly meet this competition, a low rate was found to be necessary and to limit the use of electricity by special rules and numerous "Don'ts" did not seem to be the way to build the industry to its proper place.

This rate has been arrived at only after a great amount of study and investigation. It has been carefully figured from every viewpoint based on the number of kilowatts sold in the past year. About the only difficulty found in connection with this rate is the possibility of a too rapid growth. Sufficient margin has been allowed to take care of a more than normal growth.

This Department was established in 1909, when the existing company with 195 customers was purchased by the city. There has been a steady growth since that time until their lines are now serving 3,300 customers. This growth has been accomplished from time to time by reductions in the price of current until with the establishment of their new rate, they are now selling electricity for any or all purposes as low as 1c per kilowatt hour.

The water and light plants are operated together under the management of H. B. Lynch, and have always been entirely self-sustaining. All extensions and improvements, interest, and depreciation and the retiring of the bonds being taken care of out of the income.

This new rate is a decided cut under the previous charges and amounts to a reduction of from one-third to one-half on the majority of bills. Coming in the face of rising prices and the increased cost of doing business, this rate is being very favorably received and is sure to prove an important factor, promoting new growth and attracting new industries to Glendale.

REJUVENATING THE MOTHER LODE BY ELECTRICITY

BY W. E. ESKEW

(The greater efficiency and adaptability of electric power has put many a dying industry on its feet. How the great mother lode of California has been saved from early exhaustion by the application of electricity is interestingly told in this article. The author is a district manager of the Pacific Gas & Electric Company.—The Editor.)

The application of electric power has been rapid and its use extended to all branches of the mining industry, until at the present day there is a connected load in Amador county of 10,035 horsepower in motors. Its first application was for driving mills where constant speed is absolutely essential for the successful operation of the concentrators. For this purpose it proved the ideal motive power and soon made a fast friend of the "mill boss" who had at first received it with, to say the least of it, skepticism. The motor-driven air compressor with the accompanying pneumatic drills was not long in supplanting the old method of hand drilling. The air compressor at the Old Eureka mine is a typical example of the type in general use by the mines of this district. This is an Ingersoll-Rand, Imperial type compressor with high and low pressure cylinders, and compresses to 100 pounds pressure per square inch. It is driven by a 160-h.p., 440-volt, 720-r.p.m. Westinghouse Type C. S. motor and handles 1200 cubic feet of air per minute.

Another, and perhaps one of the most important uses to which electric energy has been applied, is in its adaptability to driving underground pumps. Prior to the advent of electricity, two methods were in vogue for handling the water. The first and simplest method was by hoisting or "baling" the water. When, however, from 100,000 to 150,000 gallons of water a day had to be hoisted, as was often the case in the rainy season, it left little time for anything else.

A notable example of an underground pumping installation at the present time is that at the Argonaut mine. Here a 3-cylinder plunger pump, driven by a 75-h.p., 2200-volt motor, is located at the 3900-foot

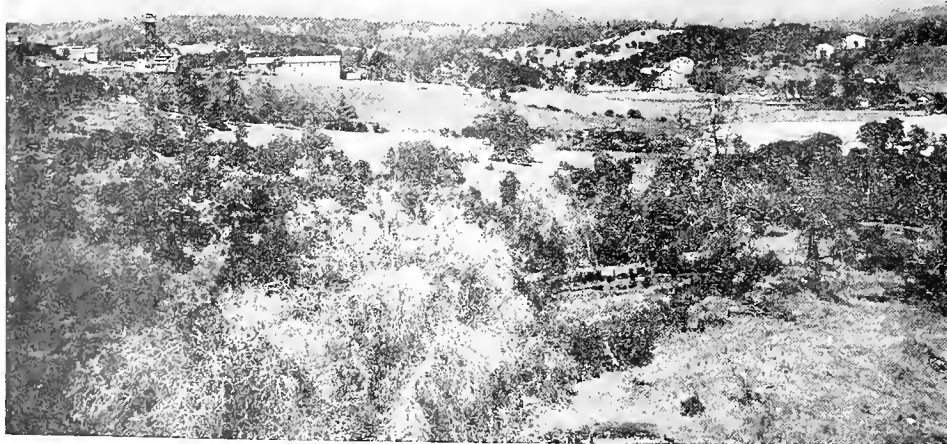
level, or 3900 feet below the surface. This pump lifts the water 1900 feet to the 2000-foot level, where a similar pump, together with the necessary piping, is being installed to lift the water a distance of 2,000 feet to the surface. Another noteworthy installation is at the 2000-foot level in the South Eureka mine. Here a duplicate set of pumps and motors are installed, consisting of high pressure triplex pumps, each geared to a 150-h.p., 440-volt motor. The duplication is made to insure the mine against becoming flooded in case



The new electric hoist at the Old Eureka mine

one of the motors should burn out or a pump become disabled for any considerable length of time. These pumps handle the water from both the South Eureka and the Central Eureka mines, which are connected at different levels underground. This 2000-foot level is at a vertical depth of approximately 1800 feet, representing a water pressure of nearly 800 pounds to the square inch, or considerable more than that of any of our high-head water-power plants.

The mine operators were somewhat slower to adopt the electric hoist, as in the earlier days of the industry interruptions of service were not infrequent, and it was not pleasant to have the power go off with a large body of men underground and no way of bringing them to the surface. However, with the rapid improvements in the electrical industry, interruptions became less and less frequent and that feeling has now entirely



General view of the Kennedy mine on the Mother Lode near Jackson, Amador County. Note the 100-stamp mill (on the left) and the four wheel houses (right)

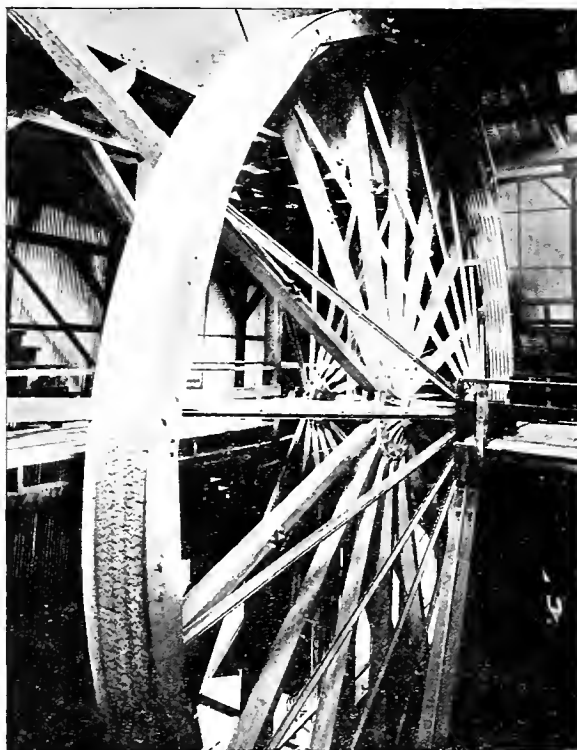
died away. The first electric hoist was installed at the Bunker Hill mine in 1907 and consisted of a 150-h.p., 550-volt, 450-r.p.m. G. E. motor, geared to the pinion shaft of the hoist. As the mine went deeper and increased the milling capacity, this hoist later proved inadequate and in 1911 was replaced by a 300-h.p. Westinghouse motor of the same speed. This motor, instead of being geared, was equipped with a rope transmission, thereby eliminating much of the noise of the geared drive and somewhat lessening the strain on the motor, due to a certain amount of flexibility between the motor and hoist.

The next installation of an electric hoist was at the South Eureka mine in 1910, where a 200-h.p. motor was installed in place of the former steam hoist. This motor, however, proved too small to handle the work and in the same year was replaced with a 400-h.p. General Electric motor. The duty imposed upon even this motor was too severe, it developing at starting as much as 1300 horsepower. After a couple of years, an exactly similar motor was mounted on the opposite side of the sheave and these two are operated as one motor from the same controller, giving a rated capacity of 800 horsepower.

Perhaps the most interesting installation of all is that at the Argonaut mine, where a 225-h.p., 2200-volt Westinghouse motor is installed on the 3900-foot level, or nearly 2000 feet below sea level. All of the ore is now being extracted from below the 3900-foot level. It is first hoisted to this level, where it is dumped into an ore bin, from which it is again loaded into skips and hoisted to the surface by means of the first-described hoist. Here again it is loaded into cars or skips and then hoisted up the tramway to the mill located on the hill above.

The Kennedy Mining and Milling Company adopted the expedient of elevating tailings after they leave the mill. The tailings are conducted from the mill to the first wheel, and from each wheel to the

next by means of flumes built on about a $2\frac{1}{2}$ per cent grade, as on a less grade than this the sand will not flow. The wheels are built on what we might call the "inverted principle" of an overshot water wheel, the pulp filling the buckets at the bottom, and as the wheel revolves it is discharged near the top. Each wheel is fifty-six feet in diameter and lifts the pulp

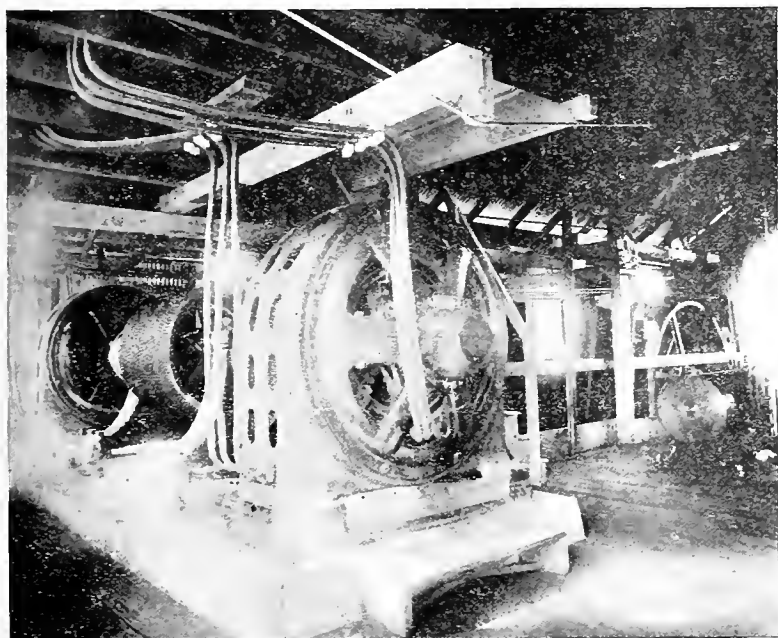


Wheel used for elevating tailings from the Kennedy Mill

forty feet, being driven by a 15-h.p. motor. The buckets are at the outer periphery of the wheel, the circular part shown being merely the pulley carrying the belt from the motor. These wheels make three revolutions per minute.

The ore bodies of the Mother Lode are all relatively low grade, and as they are worked to greater and greater depths the cost of extracting the ore is increased proportionately. Added to this is the extra burden of having to expend large sums for impounding their tailings, and the increased cost of all supplies, chief among which are lumber, steel and powder. The copper, zinc and other metal mines can well stand the increased cost of mining because of the high market value of their product, but the value of an ounce of gold has shrunk until its purchasing power is the lowest it has ever been in the world's history.

It is, therefore, only by the application of the most modern methods and appliances that these mines are able to be worked at a profit, and I do not think it too much to claim that, were it not for the wide application of electricity and its adaptability to such a diversity of uses, few of the mines of the Mother Lode would be in operation today.



Electric hoist at the South Eureka mine showing the two 400 h.p. motors on the same shaft

THE OPEN DOOR OF THE PACIFIC

(Other electrical manufacturers and dealers are doing a profitable export business—why not you? The American people have heretofore been backward about going outside their boundaries, but the time is at hand when the opportunity is not only waiting but asking for you to meet it. And it is in the lands which border the Pacific that most of these opportunities are to be found. Here is a list which almost completes the circle of Pacific shores.—The Editor.)

ENCOURAGING INTERNATIONAL TRADE

In a recent address before the Southern Commercial Congress, John Clausen, Vice-President of the Crocker National Bank of San Francisco, points out some of the ways in which the United States can meet the keen competition which will follow the war. He made it clear that while there is doubtless too much optimism in some quarters, there is bound to be a considerable change in the financial position of the United States after the war. The volume and direction of our trade will be different. The ability of European nations to furnish capital to other countries will be lessened, perhaps for a period of many years to come. South and Central America, China and Mexico may turn to us more than ever before for their financial needs.

Our people however have not been generally accustomed to make investments at a distance. They must be educated along these lines and encouraged by organizations similar to that of the British Trade Corporation recently formed. The fundamental object of this organization is the giving of financial assistance to British traders and manufacturers, especially in connection with overseas trade, without in any way acting as a competing contractor, merchant or trader. The recently passed Federal Reserve Act with its facilities for Branch Banking in foreign countries offers an opportunity for such a development. The legislation now before the Senate admitting of combinations in export trade will further help the situation.

Manufacturers are beginning to realize that their most aggressive competitors are not their fellow-countrymen engaged in international trade, but rather the powerful combinations of merchants in other countries.

INCREASED USE OF ELECTRICITY IN NEW ZEALAND

The British Trade Commissioner in New Zealand writes that, owing to a recent labor dispute at Wellington, the gas supply for all purposes has been restricted, and this has led to a large increase of orders for the installation of electric lighting, heating, cooking, etc., appliances. Householders and business people turned to electricity as a substitute or stand-by for their various requirements, and electrical engineers and suppliers of electrical goods experienced a rush of business. According to the local press, the sale of electric cookers, heaters, kettles, smoothing irons, etc. constituted a record and, further supplies of such articles being difficult to obtain, stocks are now low. For some time past the only market open to New Zealand buyers for the purchase of electrical goods has been the United States, but now even that source is becoming uncertain.

ELECTRICAL TRADE WITH HONGKONG

The declared exports from Hongkong to the United States for the first half of 1917 amounted to substantially twice the exports from the colony to the United States in the whole of any previous normal year. This record arises partly from higher values but mostly from increased volume of trade. It is in keeping with that steady gain in the trade with the United States which has characterized the trade of



One of the great freight carriers of the Pacific—the steamship China

Hongkong for the past eight years and which has been accentuated and accelerated during the war in Europe. Aside from trade with America the business of the port has changed little from the volume of the last half of 1916. In many lines of imports it is practically impossible to secure deliveries because of conditions in the United States and Europe, this being particularly true as regards steel and metal goods generally and most kinds of machinery, especially electrical machinery and materials. From the United States, however, imports in most of these lines have continued far above normal.

ELECTRICITY IN RUSSIA NOW AND AFTER THE WAR

The Electrical Review of London publishes a survey of electrical conditions and opportunities in Russia prepared by a Russian investigator who has been analyzing conditions elsewhere, particularly in America, with a view of applying methods to Russia:

The supersession of the kerosene lamp by the electric lamp will become intensified in Russia in the near future, the more so as with the rational installation, production, and distribution of electrical power, electric lighting, at least in the towns, can easily compete with gas, and even with kerosene lighting. Gas and kerosene have their particular spheres of application where electricity, at least in the near future,

cannot compete. With the chronic scarcity of coal in Russia, and the urgent necessity of it for the metallurgical industry, the burning of coal for lighting purposes appears to be, from the point of view of economy, altogether inadmissible, as electrical power can be successfully obtained by the use of cheap fuel—such as brown coal, peat, and the many water courses.

The expenditure of electrical energy in the eight years, 1905-1913, for lighting purposes only, increased by 73 per cent, whilst the expenditure for motors and other industrial purposes rose 473 per cent. In other words, the application of electricity for motors and general industrial purposes increased during that time $6\frac{1}{2}$ times quicker than for lighting purposes. But if we take Poland into account, the expenditure of electric energy in 1913 for the whole Empire amounted to about 2,000 million kw.-hours, of which only $20\frac{1}{2}$ per cent was used for lighting and $79\frac{1}{2}$ per cent for motors, whilst in 1905 the deliveries for lighting made 46 per cent and for motors 54 per cent only.

American industry, as is known, is distinguished by the highest productivity in the whole world, and that is explained, to a large extent, by the fact that, being always short of hands, the Americans were obliged more than in other countries to adopt the principle of attaining the largest possible result with the smallest expenditure possible of labor. Russia belongs to the list of countries that enjoy such advantages, and therefore the rational development of the production of electrical power is one of the first problems to be dealt with immediately after the war.

If we turn to the present condition of the Russian electrical industry, we shall see that with very few exceptions—for example, the Moscow station—the Russian electrical stations are equipped irrationally in technical respects and, above all, with old machines. As the still young electrical industry is in a stage of rapid development, it has of recent years made such colossal progress that the machines installed in the Russian stations 10 or 15 years ago, perhaps at the time the very last word in technical equipment, are at this moment quite unsuitable for electric current production.

JAPAN'S ELECTRICAL INDUSTRIES

The Department of Communications has published the following statement of the condition of the electrical industry in Japan at the end of July, 1917: Plants supplying current, 568 companies with \$160,796,063 capital; electric railways, 42 companies, \$21,706,985 capital; engaged in both branches, 48 companies; \$148,482,339 capital. Compared with the figures for the corresponding period last year there is an increase in the number of enterprises of 35, with an aggregate capital of \$17,892,057.

ELECTRICAL ACTIVITY IN VENEZUELA

The machinery for the electric light plant at San Carlos, capital of the State of Cojedes, is expected to arrive shortly. It is hoped that the plant will be in operation by October 28. Sr. P. J. Diaz Otero recently visited Duaca, State of Lara, in the interests of a project for supplying that municipality with electricity. The municipal council is studying the project.

LOW POWER RATES IN CANADA

The Hydroelectric Commission of Ontario is a government commission charged with developing and purchasing water power where available in the province and selling electrical energy at cost to municipalities, the price being adjusted from year to year. About 702,000 h.p. of the estimated 5,000,000 h.p. in Ontario has been developed. The consumption of coal for power is said to have been reduced to the extent of 4,500,000 tons, a saving of about \$20,000,000.

The commission, heretofore has concentrated its efforts on the western part of the province, the demand for power being more urgent there. Now, however, more attention is to be given to the east. An agreement has just been entered into with the Cedar Rapids Power Company (a concern auxiliary to the Aluminum Company of America) to furnish 10,000 h.p. of electrical energy of 110,000 volts at a point near Cornwall, which power would be available for the towns in this district.

The Cedar Rapids Power Company, constructed a 45 mile transmission cable, carrying 100,000 h.p. of electrical energy, from Cedar Rapids in the St. Lawrence River, 30 miles east of Cornwall, through Cornwall to Massena, N. Y. (See Daily Consular and Trade Reports for July 12, 1913, and Sept. 22, 1914.) This power, although going through Cornwall, has not been available for local industries because of the lack of a stepping-down station. The Hydroelectric Commission plans to erect such a station.

The price to be paid the Cedar Rapids Company by the commission will be between \$11 and \$15 per h.p. The cost of stepping down from the 110,000 volts to a voltage suitable for Cornwall's purposes, say to 26,000 volts, would make the price about \$24, the price being reduced in proportion as the amount of horsepower used is increased.

OPPORTUNITY FOR AMERICAN TELEPHONE SYSTEM IN MEXICO

The telephone equipments in use in the cities of Progreso and Merida, Yucatan, Mex., are of an antiquated Norwegian make and the service is unsatisfactory according to newspaper reports.

Public sentiment is said to be strong in its demand for a better service and two of the leading industrial and commercial organizations are installing temporary independent telephonic connections between their Progreso and Merida offices.

The time is opportune for American manufacturers of telephones to get in touch with the proper interests in Yucatan, some of whom, it is stated, have expressed their desire to receive correspondence and literature on this subject.

OPPORTUNITIES IN URUGUAY

A manufacturer of woolen goods in Uruguay desires to be supplied with the latest catalogues of American firms making machinery of all kinds used in the woolen industry, motor and electrical equipment, and motor trucks. All literature should be sent post prepaid in the open mail, as there are many delays incident to mail deliveries by parcel post. The accompanying correspondence should be in Spanish.

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(Over and above the return which the money invested would bring on the money market, the owner of a public utility is entitled to a "profit" as a reward for having established the business and for the risk in conducting it. He should be permitted to share in the prosperity he has helped create. With due regard to permissible rewards for good management, the rates can therefore best be fixed by establishing a definite ratio to the volume of business involved.—The Editor.)

PUBLIC UTILITY RATES AND THE VOLUME OF BUSINESS

In presenting the following ideas relating to the profit which the public utility should earn, the writer disclaims any intent to appear as an advocate of limiting the profit which the owner of the public utility can make at reasonable charges for the service rendered or the commodity furnished. When the owner succeeds by efficient management in keeping operating expenses low he is entitled to a suitable reward. His treatment by those who are charged with regulating rates should be such that efficient management will be encouraged and not discouraged. The suggestions which follow should be considered in the light of these qualifying statements.

The compensation to which the owners of public utilities are entitled for management and business hazards, or, speaking broadly, the profit to which they are entitled, can not be brought into any definite, universally applicable relation to the capital invested in such enterprises. Another element, the volume of business, deserves consideration in this connection.

That there should, in the case of every legitimate public utility, be some profit will be admitted. This profit will appear as an excess of earnings, present and prospective, over a fair allowance for the use of the money invested in the utility, provision having first been made for operating expenses and replacement requirements. It has been customary heretofore to use value as the starting point when rates are to be fixed with inclusion of some allowance for 'going value.' The general practice also prevails of introducing into the calculation a rate of return on the so-called "fair value" of the property, higher than ordinary interest rates. Without giving special consideration to the question of compensating the owner for management and of allowing him to share in the general prosperity of the community, which prosperity he has helped to create, a way has thus been found to permit the utility to yield some profit. Under such procedure there will be cases, however, in which the profit will be very large and may be an onerous burden upon the rate-payer, as in the case of certain utilities in which the amount of invested capital is large when compared with their annual gross income and particularly if the ultimate profit is swelled by the increasing value of large holdings of real estate. And there will be other cases in which the profit may be small and inadequate under reverse circumstances, when the volume of business is large in comparison with the invested capital. As an example of the first kind, certain water supply enterprises on the Pacific Coast might be cited. These not only require the investment of relatively large amounts of capital but in connection with some of them large areas of land are held for

reservoir and related purposes. As an example of the second kind, certain express companies may be noted which operate under contract with other transportation companies and which do a large business on a small investment of capital.

The proposition has, therefore, been submitted as noted in a preceding article of this series, that the equitable arrangement would be to bring the profit, covering compensation for management, for hazard, and for participation in general prosperity, into some definite relation to the volume of business, that is, into some fixed relation to the amount of annual gross income.

When the procedure is followed of applying the interest return to a rate-basis determined from the amount of capital legitimately invested, including cost of developing the business, cost of franchises, water-rights and the like, but without deduction of accrued depreciation, a reasonable profit allowance should not be difficult to determine. If the interest allowance on the rate-base be supposed to cover the full cost of borrowed money, due regard being had to the effect of legitimate discounts and commissions, then certain additions to earnings, perhaps about as below set forth, would be fair and proper, this being in lieu of interest on the additions to capital, which is has been customary to make for going value, or other intangible elements. In the last analysis the intangible values result from the capitalization of profit. It will, therefore, be found simpler and more satisfactory to reverse the usual procedure by determining what the profit should be, instead of starting with a set of intangible values which after all result from the capitalization of an ill-defined arbitrary subdivision of this profit. The following profit allowances are tentatively suggested and remain subject to modification upon further study:—

When gross income is \$	10,000	about	15%	\$	1,500	per yr.
" " " "	100,000	"	14.5%	"	14,500	" "
" " " "	500,000	"	13.5%	"	67,500	" "
" " " "	1,000,000	"	12.5%	"	125,000	" "
" " " "	3,000,000	"	10%	"	300,000	" "
" " " "	5,000,000	"	9%	"	450,000	" "
" " " "	10,000,000	"	8%	"	800,000	" "
" " " "	20,000,000	"	7%	"	1,400,000	" "
" " " "	40,000,000	"	6%	"	2,400,000	" "
" " " "	100,000,000	"	5%	"	5,000,000	" "

The allowances, here suggested as additions to the interest return on the rate-base, are those which appear reasonable under ordinary conditions. They should be considered subject to modification to fit any particular case and they will not be adequate when it happens that the cost of the output has been materially reduced by the introduction of a new invention which may be the result of efficient management and skillful operation, and the use of which may entitle the owner of the utility to larger profit for a time at least than he would expect under ordinary circumstances.

RECENT ADVANCES IN WESTERN WATER LAW

BY A. E. CHANDLER

(Men of the industry, interested in the development of electric power from our streams as well as those looking forward to the increasing application of electric pumps to irrigating problems, should be familiar with the elements of western water law. The growing tendency of courts of last resort to recognize the wide scope for the proper exercise of "police power" is most gratifying to those who are striving to prevent the waste of our natural water resources. The author of this valuable series of articles is a well known member of the California Water Commission and writer on Western Water Law.—The Editor.)

JURISDICTION OF PUBLIC UTILITY COMMISSION

Gates v. Public Service Commission of Oregon, 167 Pac. 791

In 1902 the council of Dallas, Oregon, passed an ordinance providing for a public water supply, contracting with one Gates to construct a water plant for the city, and providing for the payment of \$12,000 and the lease of said plant to Gates for a period of twenty years. Under the terms of the ordinance, the city secured the land for reservoirs and necessary rights of way, and likewise the rights for the use of the waters of Canyon Creek, the source of supply. The ordinance also fixed the rates to be charged by Gates and to be paid by consumers of water within the city.

The system was completed by Gates and accepted by the city in 1904, and \$12,000 was paid to Gates as provided in the ordinance. In 1909 an agreement was made between the city and Gates reducing the rates. In 1913 the city petitioned the Railroad Commission of Oregon, claiming that the rates charged were unjust, unreasonable and excessive. Gates, in answering, challenged the jurisdiction of the Commission.

Although the Oregon public utility act includes all corporations or individuals owning, operating or managing plants for furnishing water, it also provides that no plant owned or operated by a municipality shall be deemed a public utility. In the Gates case, the Supreme Court of Oregon held that the City of Dallas is the owner of the water plant in question, and that the Commission had therefore no power to change the rates. As the ordinance and other contracts between Gates and the city are peculiar in their terms, the opinion in this case cannot be considered as holding that the court will not allow other contracts to be set aside and the rates to be fixed by the Railroad Commission.

POLICE POWER IN PREVENTING WASTE FROM ARTESIAN WELLS

Eccles v. Ditto, 167 Pac. 726.

A number of Western states have passed statutes governing the prevention of waste from artesian wells. In 1907, in the case of *Ex parte Elam*, 6 Cal. App. 233, the California District Court of Appeal upheld a California statute approved March 6th, 1907, providing for the prevention of waste from artesian wells and prescribing penalties therefor. As the doctrine of correlative rights regarding the use of percolating waters is recognized in California, it was expected that the court would so hold. In other western states however, with the exception of Washington, the common law rule of percolating waters is recognized—which is that the owner of the surface is the owner of all percolating

waters beneath the surface. The Eccles case is therefore most interesting, as it is a decision by the Supreme Court of New Mexico upholding the validity of a statute of New Mexico which not only declares waste from artesian wells to be a nuisance, but authorizes the Artesian Well Supervisor of each county to repair wells, the waters of which are running to waste, and to bring suit, if necessary, to collect the expenses of such repairs, which expenses become a lien upon the land. The opinion does not discuss the question of the ownership of percolating waters, but finds its basis in the cases upholding the exercise of police power to abate nuisances.

As shown in the opinion, there are many cases in the eastern states upholding the validity of statutes designed to prevent the waste of oil and gas.

In commenting upon the New Mexico statute, the court said (p. 728):

"There are two justifying reasons for the enactment of the statute under consideration by the Legislature of this state, the first being the necessity of using water for irrigation and the limited quantity of water available. The artesian waters in a given district come from the same source, and are obtained by sinking wells to the common basin, thereby enabling the water to find its way to the surface. Necessarily, the waste of water derived from the common source of supply diminishes the amount of water available for legitimate uses, and hence works an injury and a detriment to the general public desiring to make use of such waters. The second reason is that permitting the water to run to waste in large quantities results in the "water logging" of lands, and destroys its productiveness. In the artesian belt in the Pecos Valley, it has been found necessary to construct drains at enormous expense to carry away the waters which find their way to the lower lands. Hence we find ample justification for the legislative act regulating the construction and use of such wells, thereby preventing the unnecessary waste of water."

APPROPRIATION OF WATER APART FROM LAND

Lake Shore Duck Club v. Lake View Duck Club, 166 Pac. 309

In passing upon a dispute between two hunting clubs over the right to divert the waters of certain streams for irrigating lands and forming duck ponds, the Supreme Court of Utah was called upon to pass on the right to appropriate waters for use upon the public domain. In writing its decision the court called attention to many cases in which it was held that one might appropriate water for use upon the public domain, but in all of such cases it appeared that the appropriator had "some sort of possessory right, good as against everybody but the government." In the Duck Club case however, the lands involved were part of the public domain, "unsurveyed, unenclosed, unoccupied and untitled." Although the court did not question the fact that the waters diverted were being applied to beneficial use, it concluded that "for the

purpose of effecting a valid appropriation of water under the statutes of this state we are decidedly of the opinion that the beneficial use contemplated in making the appropriation must be one that inures to the exclusive benefit of the appropriator and subject to his complete dominion and control."

It held therefore that plaintiff's attempted appropriation is invalid.

RIGHTS OF RIPARIAN OWNER FOR SUPPLYING WATER TO RAILROAD ENGINES

Atchison, T. & S. F. Ry. Co. v. Shriver, 166 Pac. 519

In these columns, in referring to cases dealing with riparian rights, it has been stated that riparian owners are each entitled to a reasonable use of the waters of the stream upon their lands riparian thereto. In the Shriver case, under note, the Supreme Court of Kansas held that the "abstraction of water for railroad purposes by a railroad company which is a riparian owner is merely another use, the propriety of which cannot be questioned so long as the rule of fairness and equality between owner and owner is observed." The only reason for considering the case noteworthy is that, although riparian owners are entitled to a reasonable use for irrigation and other purposes, such reasonable use is restricted to use upon the land. Strictly speaking, water placed in the boilers of ordinary railroad locomotives is used elsewhere than upon the riparian land.

The Court's view that such use is a reasonable use and is consistent with the equal rights of other riparian owners should be generally accepted.

CHANGE OF POINT OF DIVERSION

Moyle v. Salt Lake City, 167 Pac. 660

In developing a water supply in the later eighties, Salt Lake City entered into an agreement with a number of farmers having rights to the use of water of Parley's Canyon Creek, under which agreement the city was to take the water of the creek and give in exchange water from its system from Utah Lake and Jordan River. Moyle, one of the parties to the agreement, owned the equivalent of 144.79 "acre shares" of the waters of Parley's Canyon Creek. As the lands upon which she was using the water became part of Salt Lake City and, therefore, were no longer used for farming purposes, she desired to change the use of water to lands owned elsewhere by her, adjacent to the city system. As the city refused to allow such exchange, litigation resulted. The Supreme Court of Utah held that as the agreement was silent as to the place of diversion from the city's system, there was no reason why the rule so long applied to change in point of diversion from natural streams should not apply. This rule, as is well recognized wherever the doctrine of appropriation applies, is that the point of diversion may be changed without loss in priority or extent of right, provided no others are injured thereby.

As the court held that the rights of the city would be in no wise affected by the desired change, it was so ordered.

THE EFFECT OF WATER POWER DEVELOPMENT ON TRANSPORTATION

BY JOHN E. SMALL

(In the editorial pages of this issue, the matter of the water development bills is considered at some length. This extract from the speech of the Congressman from North Carolina before the Southern Commercial Congress sheds new light on the possibilities latent in our undeveloped water powers.—The Editor.)

The utilization of the enormous amount of energy latent but now wasting in our falling waters is intimately connected with the solution of such great national problems as extension of inland waterways; the national defense; shortage of food; conservation of coal, oil, and labor; irrigation of arid lands, and railroad car shortage. In addition to conserving vast quantities of coal and the labor to mine and handle it, the hydro-electric energy existing in our running waters would, if developed, be utilized in the manufacture of explosives, fertilizers, wood-pulp and paper, electrochemicals, copper and aluminum, and in the operation of railroads by electricity; operation of irrigation pumping plants; operation of farm machinery; and in numberless other industrial applications.

Instead, however, of utilizing the energy contained in the force of our descending waters, we are up to now obtaining the energy mainly from steam through use of coal, which can never be replaced, and which requires hundreds of thousands of men for mining when labor is so scarce, and cars for transportation when they are so badly needed for carrying merchandise and raw materials.

A careful estimate shows that were the water powers developed which are now wasting in the rivers of the United States and were locks installed in the power dams, over 4000 miles of the upper reaches of these streams would be opened to navigation. The cost of these river improvements would be upwards of eight hundred million dollars, and, if accomplished by private capital for purpose of power production, would not cost the Government a dollar except for the locks and removal of minor obstacles in those portions of the stream not connected with power development. This would mean the extension of navigation for an aggregate of 4000 miles in 35 rivers, traversing 20 states in such widely different sections of the country.

With the United States at war, and its every energy being exerted to increase production of farm, factory and mine, with great bodies of troops and supplies moving, and with our ships in foreign service, as well as those engaged in coastwise and lake trade, commandeered by the Government to act as carriers for troops, mar material and supplies, there will be an ever increasing volume of commerce. How is it to be transported? How are the railroads to handle it?

Germany has thousands of miles of canals and rivers which have been made navigable, and are being used for carrying heavy freight, leaving the railroads free to be used for the rapid transportation of troops and food supplies. It is said that were it not for her freight-carrying inland waterways the war would be over and Germany beaten because the rapid movement of her troops from one front to another would have been seriously impeded had the railroads been occupied with heavy freight shipments.

FUEL OIL AND STEAM ENGINEERING

(How the Baume scale is used in fuel oil practice and what it means is treated in this discussion. The confusion that has existed hitherto in the relationship of the Baume scale reading and the specific gravity of oil is cleared up. The discussion concludes with a detailed illustration of how the gravity of fuel oil is most accurately determined by means of the Westphal Balance. Following this treatment is a brief on the types of boilers used, when oil fired, that should prove helpful along lines previously treated in this department.—The Editor.)

THE GRAVITY OF OILS IN FUEL OIL PRACTICE

BY ROBERT SIBLEY AND CHAS. H. DELANY

Fuel oil is classified, marketed, and designated by its gravity. Gravity is denoted in two distinct ways. The scientific method of notation is known as the

"specific gravity," which is the ratio of the weight of a given volume of the oil to that of an equal volume of pure water. There has, however, grown up in practice an empirical method of representing the gravity of oil by what is known as the Baume scale. This scale has two separate and distinct formulas for its conversion to specific gravity readings. One formula is for liquids heavier than water and the other for liquids lighter than water. In each instance the scale is graduated to 100 degrees and overlaps 10 degrees.

Antoine Baume, a French chemist of the eighteenth century, distinguished for his success in the practical application of the science, was the inven-

tor of the so-called Baume scale now universally adopted in fuel oil practice for denoting the gravity of crude petroleum.

The Scale for Liquids Heavier Than Water.—

Baume hit upon a unique plan for the establishment of his scale. Certain fixed points were first determined upon the stem of the instrument. The first of these was found by immersing the hydrometer in pure water, and marking the stem at the level of the surface. This formed the zero of the scale. Fifteen standard solutions of pure common salt in water were then prepared, containing respectively 1, 2, 315 per cent (by weight) of dry salt. The hydrometer was plunged in these in order and the stem having been marked at the several surfaces, the degrees so obtained were numbered 1, 2, 315.

The instrument thus adapted to the determination of densities exceeding that of water was called the hydrometer for salts.

Expressed mathematically in its relationship with the specific gravity S, the Baume degree reading B becomes for liquids heavier than water:

$$S = \frac{145}{145 - B} \dots\dots\dots (1)$$

The Scale for Liquids Lighter Than Water.—

Since practically all grades of crude petroleum are lighter than water, we are more interested in the method of expression for this latter phase of gravity denotation.

The original Baume hydrometer intended for densities less than that of water, or the hydrometer for spirits, as it was called, was constructed on a similar principle to that for the hydrometer of salts above described. The instrument was so arranged that it floated in pure water with most of the stem above the surface. A solution containing 10 per cent of pure salt was used to indicate the zero of the scale, and the point at which the instrument floated when immersed in distilled water at 10° R or 54½° F. was numbered 10. Equal divisions were then marked off upwards along the stem as far as the 50th degree.

The Confusion in Expression for Specific Gravity and Baume Readings.—Modern gravities are expressed for liquid temperatures of 60°F. instead of 54½°F. as above set forth. This fact together with other inconsistencies and errors in observation have led to the invention of some seventeen different mathematical expressions, by various investigators and scientific bodies, to properly set forth a relationship between specific gravity and Baume readings for liquids lighter than water. The contest has simmered down to two equations in American practice.

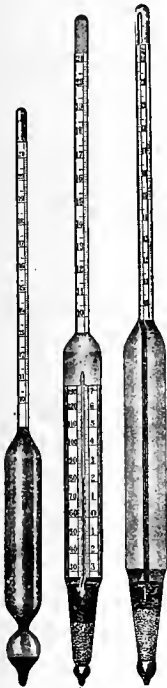
The formula that is used by Tagliabue in his tables, and that has been adopted by the Petroleum Association, which embraces within its membership practically all of the oil refiners of the United States, is as follows:

$$S = \frac{141.5}{131.5 + B} \dots\dots\dots (2)$$

On the other hand, in Kent's Mechanical Engineer's Handbook is found a formula which has been adopted by the United States Bureau of Standards and which receives the strong endorsement of the mechanical and electrical engineers of the Pacific Coast. This formula is

$$S = \frac{140}{130 + B} \dots\dots\dots (3)$$

The Limitations of the Hydrometer.—The hydrometer method of ascertaining the gravity of crude petroleum is at best only approximate as one may readily surmise. In order then to ascertain the gravity of oil with scientific accuracy, a more refined method



BAUME HYDROMETERS

is necessary. This is usually accomplished by determining the specific gravity of the oil with whatever moisture content it may contain by means of an actual water equivalent comparison, and then converting this into degrees Baume. This roundabout method once again emphasizes the uselessness of employing the Baume scale. If the moisture content of the oil has been ascertained, a computation is then made in order to arrive at the actual specific gravity or Baume reading for the moisture free oil.

The Method of the Westphal Balance for Exact Measurement.—Let us then examine in detail such a method. The Westphal balance is a convenient and accurate method by which the specific gravity of fuel oil may be obtained to four decimal points. As shown in the illustration, the apparatus necessary consists of a balance arm, supported on knife edges, from one end of which is hung a glass bulb, the other end being counter-weighted. Along the balance arm are nine notches, the hook supporting the glass bulb being in the position of the tenth notch. The glass bulb has a displacement of exactly five grams of pure water at 4°C., which is the point of maximum density of water, the density for which scientific gravity comparisons are made. Hence if the bulb above described were so immersed in water at 4°C. a five gram weight would establish equilibrium if hung from the hook. This would indicate a specific gravity of 1.0000.

The zero point of the balance is adjusted by turning a thumb screw, which forms one point of the three point support shown in the figure, until the pointers are opposite each other before the bulb is immersed. For specific gravities less than 1.0000 the five gram rider called the unit weight is hung in a notch such that equilibrium is nearly reached, never exceeded. This gives the first decimal place. The 1/10, 1/100, and 1/1000 unit weights are then hung respectively in notches so that equilibrium is finally established. The specific gravity is then read directly to four decimal places by noting the notches in which the riders hang, commencing with the large strider. Thus when the unit weight hangs in the ninth notch, the 1/10th weight in the sixth notch, the 1/100 weight in the seventh notch, and the 1/1000 weight in the third notch, the specific gravity is evidently .9673.

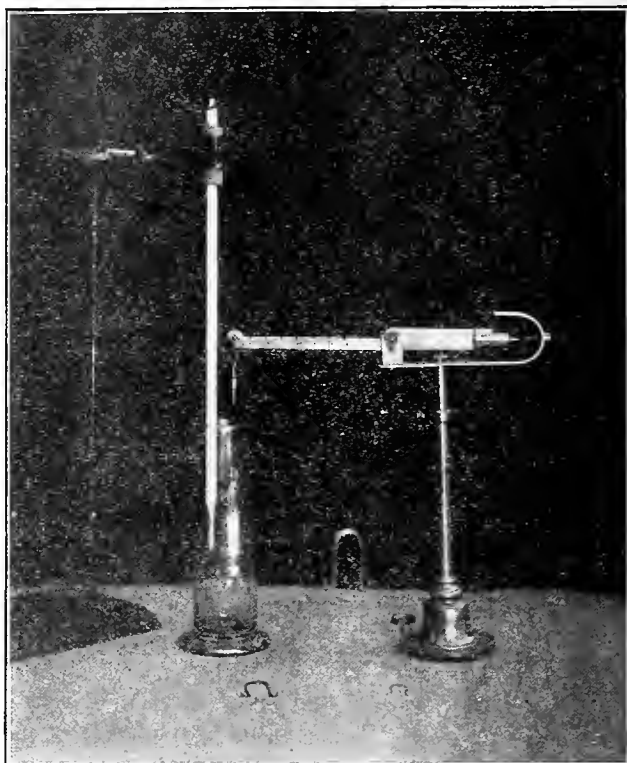
Details of Procedure.—Before proceeding with a gravity determination, the oil sample should be allowed to stand in the laboratory several hours in order that any drops of water in the oil may settle. A small quantity is then poured from the sample can into a suitable glass jar. The Westphal balance, having been dusted with a soft brush, is then adjusted to equilibrium and the specific gravity of the sample obtained. The temperature is also ascertained by means of the thermometer inserted in the oil sample. Since specific gravities of fuel oil are by common practice referred to at a temperature of 60°F., it is now necessary to make a second determination at a temperature differing by 15° to 20°F. from the first, in order that we may have sufficient data with which to compute what the gravity would be at 60° temperature.

To take this second reading the temperature of the sample in the jar may be raised by immersion in a water bath. In doing this great care must be taken to allow no water to get into the oil.

Computations Involved.—Let us next illustrate the computations involved in a gravity determination. Let us assume that by means of the Westphal balance, the oil sample is seen to have a specific gravity (S_1) of .9644, at a temperature (t_1) of 68.9°F., and a specific gravity (S_2) of .9587 at a temperature (t_2) of 86.6°F. Since the specific gravity has changed ($S_1 - S_2$) over a temperature change of ($t_1 - t_2$) the change for 1°F.

would be $\frac{(S_1 - S_2)}{(t_1 - t_2)}$. This change in specific grav-

ity for 1°F. is the coefficient of expansion (C_e), for the oil and may be expressed by the formula



A COMMERCIAL BALANCE FOR DETERMINING SPECIFIC GRAVITY OF OIL

The common hydrometer is not of sufficient accuracy to determine the specific gravity of oil used in fuel oil tests. A simple and accurate method for such determination is accomplished by the employment of a Westphal Balance as shown in the illustration. The specific gravity is first ascertained by comparison of the oil with a water standard and then by means of the mathematical relationship connecting specific gravities and Baume readings, the latter gravity reading is ascertained.

$$C_e = \frac{(S_1 - S_2)}{(t_1 - t_2)} \dots\dots\dots (4)$$

In the particular case then we now find that

$$C_e = \frac{.9644 - .9587}{69.9 - 86.6} = -.000322.$$

The coefficient is thus seen in this case to represent an intermediate value, for in practice we find that in different oils C_e varies from (— .00027) to (— .00042).

From the fundamental definition of the coefficient of expansion it is now seen that at 60°F., the specific gravity becomes

$$S = S_1 + C_e (60 - t_1) \dots\dots\dots (5)$$

Consequently by making the proper substitutions for

the case cited we find that the numerical value of the specific gravity of this oil sample for 60°F. is

$$S = .9644 + [-.000322 \times (-8.9)] = 0.9673$$

In order to convert this specific gravity to the Baume scale we now, by substituting in formula given above for such conversion, find that

$$B = \frac{141.5}{S} - 131.5 = 14.78^\circ$$

Assuming that this particular oil sample has been found to contain 0.5 per cent by weight of moisture and 0.484 per cent by volume, let us now see how we should find the specific gravity of the dry oil. Let V_w represent the percentage of water by volume and S_w , S_o , S_m represent respectively the specific gravity of the water, dry oil, and moisture. Then we may write the following relationship:

$$S_m = S_o \left(\frac{100 - V_w}{100} \right) + S_w \left(\frac{V_w}{100} \right) \dots \dots \dots (6)$$

From scientific tables we find that S_w at 60° F. has a value of .9990, and from the Westphal balance S_m has been found to be .9673. By transforming the formula above it is seen that

$$S_o = \frac{S_m - S_w \left(\frac{V_w}{100} \right)}{100 - V_w} \dots \dots \dots (7)$$

Consequently S_o may now be computed numerically.

$$S_o = \frac{.9673 - .00484 \times .9999}{1.00 - .00484} = .9671$$

If it is desirable to ascertain the Baume reading for the dry oil, we next ascertain its value from the above relationship of specific gravity and the Baume scale from equation (2).

$$B = \frac{141.5}{S} - 131.5 = \frac{141.5}{.9671} - 131.5 = 14.8^\circ$$

According to formula (3) this Baume reading would of course be computed as follows:

$$B = \frac{140}{S} - 130 = \frac{140}{.9671} - 130 = 14.8^\circ$$

When a large quantity of oil is to be purchased and it is desirable to carry the Baume reading to still further decimal points, the two formulas will not of course check; hence, one or the other of these formulas should be agreed upon prior to a purchase of any magnitude.

TYPES OF BOILERS USED, WHERE OIL FIRED

One of the oldest forms of steam boilers and one that is still used extensively is the return tubular boiler. This is a fire tube boiler consisting of a shell or drum supported by brick walls which enclose the furnace. Inside the drum tubes are provided, running from end to end of the drum. The fire burns under the front end of the drum and the gases of combustion pass to the rear of the drum and then forward through the tubes, emerging from the front of the boiler to the smokestack. This boiler is suitable for oil firing, the oil burner being placed in the front and shooting the flame back toward the rear. Return tubular boilers are built in sizes up to 150 h.p. and are probably the most popular type of boiler for small sizes below 100 h.p. for stationary work.

Water tube boilers are used exclusively in large power plant work and are built in standard sizes up to 750 or 1000 h.p. and special boilers have been built as large as 2000 h.p. The many different makes of water tube boilers can be divided into three general types which may be designated as the B & W type, the Stirling and the Heine type.

The Babcock & Wilcox boiler is a sectional water tube boiler in which the tubes are expanded into vertical sectional headers. All of the tubes in any one vertical line are connected to one pair of headers but the different headers are not connected together except at the points where they tie into the steam drums and the mud drum. The steam drum may be either longitudinal or cross drum, the former having its axis running from the front to the rear of the boiler and the latter across the boiler. The headers are constructed of cast iron for low pressure boilers and of wrought steel for high pressure boilers, the latter construction making a boiler entirely of wrought steel. Owing to the fact that the headers are independent of one another this makes a very flexible construction, so that the boiler will stand sudden changes of temperature without causing trouble. The boiler is provided with vertical baffles so that the gases of combustion are led up across the tubes and then down and finally up again.

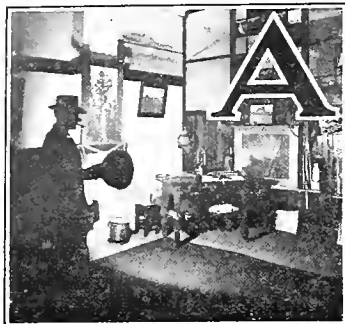
There are two general methods by which B & W boilers can be fired with oil, known as the front shot and the back shot. With the front shot arrangement the burner is introduced through the front wall and the flame is shot back towards the bridge wall. With the back shot arrangement the burner is placed at the bridge wall and the flame shoots forward. Owing to the fact that the tubes are inclined downwards toward the rear, the back shot arrangement gives a larger furnace volume at the end of the furnace farthest from the burner. This is of considerable advantage in permitting the gases to expand and cause perfect combustion. Another advantage of the back shot burner with this type of boiler is that the flame is shot forward and comes in contact with the front end of the tubes, whereas with the front shot burner the gases are forced back close to the front baffle and do not have any tendency to fill the front pass of the boiler. This condition is illustrated in the adjoining cuts. The result is that with the front shot burner a considerable portion of the heating surface is by-passed by the gases and is therefore, non-effective.

BUSINESS BUILDING
SELLING IDEAS
DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS
COST KEEPING
ESTIMATING

NEW LAMP USES



The 500 Watt Lamp in Use

ALERTNESS is an attribute of the successful contractor-dealer that is being developed to a high degree in the West.

Here is a suggestion for a new avenue of lamp sales that should immediately net additional revenue to every contractor-dealer that is awake to its possibilities in his locality.

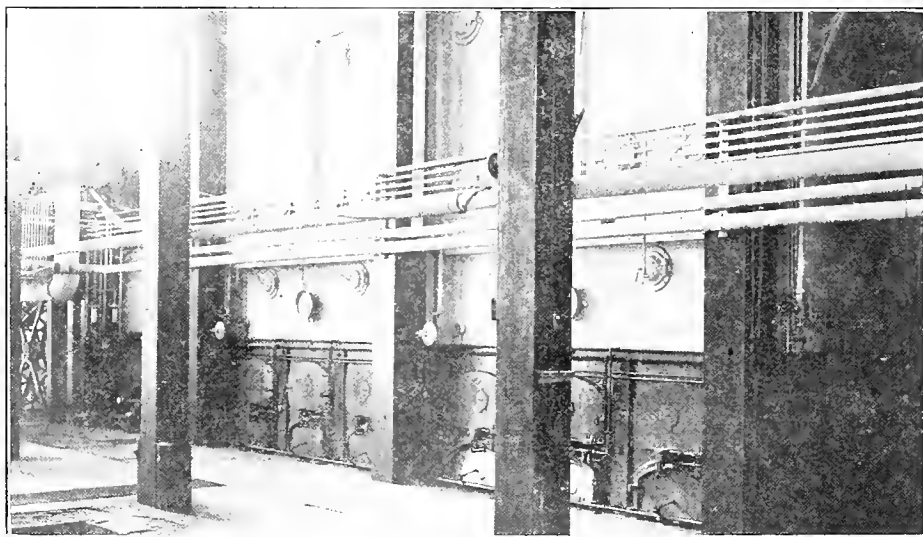
A new use has recently developed for the 500 watt Mazda lamp. Its use is in photography. Every photographer, engaged in the taking of interior views should purchase a 500 watt lamp. When the following brief is read it will be seen that the up-to-date photographer can not afford to be without this new equipment. Hence there is a new open door opportunity for the contractor-dealer in every locality of the West.

It recently happened that the editorial department of the Journal of Electricity was notified of a new invention by the Westinghouse Air Brake Company whereby a delicate control of fuel oil regulation is accomplished. In order to properly illustrate this new installation in the columns of the Journal of Electricity a photograph of the dark interior of the new Bush Street Station of the Great Western Power Company at San Francisco was necessary. The Pacific Photo and Art Company was engaged to do this work. The upper view shown in the illustration was taken by means of the methods formerly used in photography. It is to be noted that the controller at the side of the boiler on the right did not appear clearly in this view. A 500 watt Mazda lamp was next used by the pho-

tographer and by sweeping its effect against the darkened portion of the installation the desired clearing of shadows was brought about as shown in the lower view.

This unusual application of the 500 watt lamp opens up a vast field of new sales for the electrical contractor and dealer. The question is, who will be the first on the job in every community of the West to sell this new idea to the local photographer?

This is one instance of how alertness may be applied with profit to the contractor-dealer. Many other such ideas are daily presenting themselves to the trade and through the columns of the Journal of Electricity the contractor-dealer may expect to find useful hints in each succeeding issue.



BEFORE AND AFTER

The upper view is the best that can be obtained by flashlight—but note how the use of the 500 watt lamp in the lower picture has brought out the dark wall and controller device at the right.



THE CENTRAL STATION AND THE CONTRACTOR

BY W. R. PUTNAM

(That the central station is vitally interested in the welfare of the contractor is almost an axiom—and the central station man here points out that the contractor is interested in seeing the central station succeed as well. Very definite suggestions for co-operation are included in this article which covers in substance the address given recently by the author who is sales manager of the Utah Power & Light Company, before the Utah convention of Contractors and Dealers.—The Editor.)

There is no question but what there has been a wonderful change in viewpoint during the past generation. Today men have a realization that a successful undertaking is impossible in all kinds of industries unless you have the confidence and co-operation of the several branches of the industry. The success of central station undertakings is primarily dependent upon increased business and no central station can be successful in increasing business unless it has the assistance of all branches of the industry. The central station is first dependent upon the good will of its customers and second, upon the good will of the dealers and contractors in its territory.

The central station industry has as its responsibility the most extensive use of electrical service, in the territory it is serving, that is possible. That is our aim. We, of course, are employing men whose business it is to secure this business. We have the same responsibility to our stockholders that you have to your stockholders. We must consider the money invested in our business that is entitled to a fair return.

One place where contractors and dealers can co-operate with the central station is in connection with this situation. You undoubtedly will be interested in knowing that the Utah Light & Power Company did not earn 6% on the money invested in its business during the past year. This is too small a rate of return. The only way that this can be increased is either by increasing business or by increasing the rates at which current is sold. The central station industry has been affected by the advance in cost of materials the same as your business has been affected, with this difference, that we are not in position to as readily raise rates as are you people. Possibly we will not be able to increase our business to the point where we can pay the increased cost of materials and labor and at the same time pay a reasonable rate of return on our investment. If such a condition happens, you men can be of wonderful assistance in helping the power company to secure whatever raise in rates may at that time be found necessary. You will owe it to yourselves as well as the central station to render this aid, as a central station in your territory which is in financial straits will be unable to finance the necessary power developments and extensions to care for increased business, with the result that there will be stagnation so far as the electrical industry in its territory is concerned which would result in decreased business for all of you men.

In reference to the division of work between the various branches of the industry the contractor and

dealer should, without question, handle installation work in this territory. They also should be very active in the merchandising of all electrical goods including lamps and appliances. At present you men are handling practically all of the installation work on customers' premises, except in some of our small towns where you are not equipped for this work. As a result, it is our intention to keep out of this class of work. We also aim to have the sale of motors in our territory handled by the contractors and dealers.

As you know, we have assisted contractors and dealers in financing installation work from time to time, particularly with all house wiring. I will grant that we are not doing as much as we might in this respect, but unfortunately the central station industry

has been hit harder than any other branch of the industry in the present financial situation. We cannot secure money for extension work out of our earnings. We must secure new money to finance all extension work and money is not to be had at this time. Undoubtedly when financial conditions reach normal we will be able to render you more assistance in financing deferred payment sales of larger appliances.

Probably the largest field for additional work on your part is in the sale of additional wiring, fixtures and appliances for use in the home. We all are interested in securing the greatest saturation possible. However, saturation as far as the use of electricity is concerned, will never be obtained. We owe to our customers, as well as to our stockholders, the securing of this business so that our customers will have better and more convenient homes. The central station in its advertising is trying to impress upon its customers, as well as prospective customers, the very many ways in which electric current can be advantageously used by them. This opens up the way for business on your part. The central station has felt that it was necessary for it to take a very active part in this class of merchandising and I appreciate that this activity has opened the central station to criticism by you men. However, you must appreciate that our duty requires us to adopt the quickest method of securing this business in order to increase our kilowatt hour sales.

Our company has been operating some five years in this territory. Our merchandising business the first year amounted to \$97,000.00. The first eight months of this year we show an increase of 63% over the first eight months of last year and our total merchandise sales for the year will reach approximately a half million dollars. There is no reason why all of you men

WHAT THE CENTRAL STATION CAN DO

Finance installation work.
Advertise the use of electricity.
Co-operate with dealer in maintaining prices.
Frankly discuss mutual problems.

WHAT THE CONTRACTOR CAN DO

Help the Central Station to get fairer rates.
Concentrate on wiring, fixtures and appliances.
Better window displays.
Better shop arrangement.
Utilize Central Station advertising.
Talk over troubles with Central Station.

should not have increases in your business in approximately the same proportion if you had taken advantage of the conditions.

The contractors and dealers in this territory are not at present properly equipped to handle this merchandising business. You are not ready to spend the amount of money every year required for advertising purposes; you do not have proper display rooms; you do not give the attention to window dressing that is required and do not have the floor salesmen and other facilities to take care of this volume of business. However, if you have followed the central station advertising you will note that the bulk of their advertising is directed to the education of the consumer as to the

of goods on your sales floor that has drawing power.

Possibly you have seen the analysis of conditions in San Francisco recently published. There it has been ascertained that the department stores are doing more electrical appliance business than all of the electrical stores in San Francisco. A similar condition is gradually developing in this territory and it behooves you men to exert your utmost efforts if you wish to continue the electrical merchandising business.

In reference to the amount of merchandising business that may be obtained in our territory: There is no reason why every household located where electric service is available should not spend fifty dollars per year for electrical equipment. In the state of Utah

THE UTAH SOCIETY OF ELECTRICAL CONTRACTORS AND DEALERS

Here is a striking instance of how men of the electrical industry in the West are pulling together for the common good. By the linking together of all electrical contractors and dealers in the Utah district, each member hereafter will profit by the experience of a thousand workers, and it would be difficult to overestimate the helpful results that are bound to follow. This is only one instance of the marvelous co-operative spirit that is sweeping the West in all matters electrical.



Officers and Executive Committee of the Utah Society of Electrical Contractors and Dealers

Reading from left to right: G. J. Guiver, business manager; L. G. Robbins of the Robbins Electric Company, vice-president; J. V. Buckle of the Buckle Electric Company, president; E. H. Eardley of Eardley Bros. Company, secretary; G. W. Forsberg of the Inter-Mountain Electric Company, executive committee; N. L. Taylor of the Cache Valley Electric Company, Logan, executive committee; and E. A. Brough of the Montpelier Electric Company, Montpelier, Idaho, executive committee.

advantages of the use of electrical appliances and conveniences. This advertising does not aim primarily to secure this business for the central station, but endeavors to convince the customer of the advisability of purchasing appliances, of the use of better lighting and of all other types of electric service.

There is no reason why you contractors and dealers cannot secure very valuable assistance from this advertising of the central station. Allow the central station to continue the work of educating the public and center your advertising, which need not be nearly as extensive as the central station's, upon directing the attention of the electric customers to your store as an electrical center. Endeavor to secure as permanent customers, purchasers who will form a habit of using your store as their electrical center, their place for solving their electrical problems and the place at which they will make their purchases of all electrical goods. The greater number of such centers established in our territory the better we will be pleased.

You men should gradually improve the appearance of the sales floor of your stores and particularly of your windows. I appreciate the fact that most of you in paying a high rent for your stores are paying a considerable portion of that money for location and you are wasting that part of your expenditure if you do not take advantage of the location with attractive windows, changed frequently, and with arrangement

alone there are from sixty to sixty-five thousand homes using electric service. This means that at least three million dollars a year in wiring, electrical merchandising and electrical supplies should be secured from these customers. I doubt if one-third of that business is now done in this territory, consequently there is an immense field for development for new business here and it does not seem wise for any of us to quarrel over the question of who is entitled to this business, as long as we are securing only a portion of the total possible business.

The central station in this territory will continue to co-operate with the dealers in maintaining list prices. We know that no other course is advisable, except in connection with special campaigns. Good merchandising calls for these campaigns. If we are to be successful in merchandising, we must to a very considerable extent, adopt department store methods for this portion of our business.

I trust that this talk will result in a very frank discussion by you men of this subject. We honestly want and need the co-operation of you men and must have same if we are to succeed in our undertakings. Occasionally there will be complaints of our interfering with your particular field of business. Any time that these occasions arise we are ready to frankly discuss same and endeavor to adjust conditions, so that interference will not continue.

DEMAND FACTORS FOR MOTOR FEEDERS

BY F. D. WEBER

(The use of the demand factor in determining feeder sizes for motor installations is permitted by many electrical boards throughout the nation. In the northwest, especially at Portland, the use of charts has proven a quick and efficient method whereby the proper feeder sizes may be readily ascertained. Electrical contractors and dealers throughout the West will be keenly interested in following the details of the method in use at Portland as described in the following article by the electrical engineer for the Oregon Insurance Rating Bureau.—The Editor.)

General Conditions

1. A demand factor may not be used unless the nature of the installation is such that it is certain a diversion of operation will exist.

2. The demand factor curves which accompany these rules are not to apply to any feeder supplying less than five (5) motors.

3. No feeder will be permitted to be used with a rated current carrying capacity (see rule 18, N. E. C.) less than 50% of the sum of the rated full load currents (see tables on Motor Data) of all the motors supplied by such feeder.

4. In case the load on any feeder to which a demand factor has been applied, should for any reason become such as to repeatedly blow fuses of a capacity not less than the rated current carrying capacity of the feeder, such feeder must be increased to a proper size to permit the use of fuses of proper capacity to carry the load without overfusing the feeder as indicated by its rated current carrying capacity. Table A Rating of Rule 18 N. E. C. to be used.

5. The use of the word "fuses" in these rules is a general term applying to any standard approved current limiting device.

6. Whenever one motor in a group of motors equals or exceeds 50% of the remaining total connected load on the feeder, such motor must not be included in the groups used to determine the average demand factor for the feeder. Only the rated full load or starting current values taken from the Tables of Motor Data for such motor undiminished in any way shall be used in determining feeder capacity.

7. The "full load" and "starting" current values given in the Tables of Motor Data are not large enough for motors which start under full load conditions or greater, such as motors operating pumps, compressors starting or operating under full pressure, rock crushers, machinery having heavy fly wheels, etc.; unless these motors are especially designed for the service conditions under which they are to operate and are properly equipped with exterior resistance control. Such motors must not be included in any group for determining the demand factor of any feeder. They may, however, be used on the same feeder with other motors in connection with which a demand factor is permitted, but when such is done the full load or starting current values only of such motors must be used undiminished in any way for assisting in determining the feeder size.

8. The values of full load and starting currents as given in the Tables of Motor Data are for standard motors only operating at standard speeds of 1200 r.p.m. or 1800 r.p.m. Motors operating at speeds carrying from 600 r.p.m. to 900 r.p.m. must have such current values increased by 10%.

9. The type and make of motor as well as the

ability with which the installation has been designed, are important factors in the demand which a given installation will make upon its feeder, and will always be taken into consideration in allowing a demand factor on any installation.

Note.—Motors of that type which will start without exceeding the full load rated current should not be penalized for starting current rating.

Method of Determining Demand Factor

10. For the purpose of determining Demand Factors, motors have been divided into four groups:

Group I includes motors ranging from 1 to 5 horsepower.

Group II includes motors ranging from 6 to 10 horsepower.

Group III includes motors ranging from 11 to 20 horsepower.

Group IV includes motors ranging over 20 horsepower.

Demand factor curves are given for each group.

11. In determining demand factors for a given feeder, the motors supplied by it should be arranged in accordance with their groups and data for the various sizes tabulated as shown in Table 1 for the typical problem worked out to illustrate these rules.

12. Take the number of motors falling in Group I, follow the sloping line until it rises to a point opposite the number of additional motors on the feeder, thence rise vertically until the curve for Group I is intersected. This point of intersection will indicate on the vertical scale at the left the demand factor to be used for this group. Repeat for each of the other groups. The average of these individual demand factors will then be the demand factor to be used for the feeder so far as the motors in the above groups are concerned. If there are any motors on this feeder that in accordance with preceding rules or for other good and sufficient reasons must be refused any demand factor rating, their full load values must be added to the value secured by means of the demand factors for the groups of motors given above.

The demand factor should be taken to the nearest multiple of 5%.

13. The next step will be to determine the current carrying capacity of the feeder. To do this, select one motor having the largest horsepower rating in the entire group, and from the Table on Motor Data determine the starting current for this motor. To this starting current value, add the sum of the full load current values (see table on Motor Data) of all the rest of the motors on the feeder; then multiply this value by the average demand factor previously determined. The resulting value will be that for which the feeder must be selected.

14. If there are any motors on the feeder that cannot be included in the demand factor group, the full

load current value of such motors must be added to the value of the remainder of the motors after the demand factor has been applied to them. The feeder must then be selected in accordance with this resultant current value.

15. If the motor with the largest horsepower rating on the feeder is not of such a nature that it may be included in the demand factor grouping, its starting current must be taken, to which must be added the sum of the full load currents of all other motors also not included in the demand factor grouping, plus the resultant value of the sum of the full load current values of all the motors in the demand factor grouping after applying the average demand factor. Such final value thus obtained must be used to determine the size of the feeder.

16. If more than one motor on the feeder has the same largest horsepower rating, the starting current will be taken on only one of them. If one of these motors is of a type such that it could not be included in the demand factor grouping and one or more of similar size could be so included, the starting current of the motor that cannot be included in such grouping must be taken.

17. To explain more clearly, if the largest horsepower rating on the feeder is a 50 horsepower, and there are three (3) such motors on the feeder, the starting current will be taken on only one of these motors, the full current being used for the others. If one of these motors is used for operating a pump and the other two for operating lathes or other machinery on which a diversity is known to exist, the starting current must be taken in connection with the pump motor; i. e., for the one which clearly cannot be included in a demand factor grouping.

Typical Problem

18. Determine the size of feeder to be used on the following installation of 3-phase, 220-volt induction motors:

4—1 h.p., 2—2 h.p., 3—5 h.p., 3—7½ h.p., 4—10 h.p., 3—15 h.p., 1—20 h.p., 2—35 h.p., 1—50 h.p. and 1—150 h.p. Further data shown in table below.

TABLE No. 1
220-volt, 3-phase Motors

Group	No. of Motors in Group	No. of Additional Motors on Feeder	Size of Motor h.p.	Full Load Current 1800 r.p.m.	Speed of Motor r.p.m.	No. of Motors on Feeder	Full Load Cur- rent Value for Feeder in Amps.
I	9	14	1	3 amp.	1800	4	12.0
			2	6. "	1800	2	12.0
			5	13.3 "	1800	3	39.9
II	7	16	7½	19.5 "	1800	3	58.5
			10	25.5 "	1800	4	102.0
III	4	19	15	37.5 "	1200	3	112.5
			20	50.5 "	900	1	55.1
IV	3	20	35	87.5 "	1200	2	175.0
			50	123. "	1200	1	123.0
Total 23							690.0
			150	362. "	1200	1	**362.0

*This motor falls in the slow speed class and must have its rated full load current as shown in second column increased by 10%. See Rules for Determining Demand Factors for Motor Feeders, Rule No. 8.

**Not included in total full load current values on feeder to which demand factor is applied because the capacity of the motor is more than 50% of the remaining total load on the feeder.

20. There are 24 motors supplied by the feeder, but since the 150 horsepower motor represents more than 50% of the remaining motor load, it may not be considered in the major group which is used to determine the demand factor. The major group, therefore, considered from the standpoint of demand factor purposes, consists of 23 motors.

21. Referring to horizontal scale on curve sheet, select the point indicating 9 motors and follow sloping line upward and to the right until it rises to a point opposite the position for 14 motors shown on the right hand vertical scale. From this point project a line vertically upward until it intersects the curve for Group I motors. The position of this point of intersection shown on the left hand vertical scale gives the demand factor to be used for this division of the motor installation supplied by this feeder. In this case it is 63%.

22. In the second group there are 7 motors and in addition there are 16 other motors on the feeder. Following the same procedure as for Group I, select point for 7 motors on horizontal scale; follow sloping line upward until opposite 16 motors on right hand vertical scale, thence vertically upward until curve for Group II is intersected. The point of intersection for this group is 60% as shown on the vertical scale at the left.

23. The third group contains 4 motors, leaving 19 additional motors on the feeder. Following the same procedure as for Groups I and II, the demand factor in this case is found to be 60%.

24. In an entirely similar manner, the demand factor for Group IV, which contains 3 motors leaving 20 additional motors on the feeder, is determined to be 45%.

25.	Group I	Demand Factor	- - - -	63%
	" II	" "	- - - -	60%
	" III	" "	- - - -	60%
	" IV	" "	- - - -	45%
				4) 228%

Average - - - - - 57%

Since this is nearer 55% than 60%, 55% will be used.

26. The total full load current on the feeder, not including the 150 horsepower motor, is 690 amperes. This value multiplied by 55% equals 380 amperes, which is the value to be used for the 23 motors included in the major group.

27. The current value for determining feeder size for the largest motor in any group must be the "starting current" value instead of the "rated full load" value.

28. The starting current value for the 150 horsepower motor is 452 amperes. (See Tables of Motor Data.)

Starting current for 150 h.p. motor..... 452 amp.
Demand factor current rating for balance of
motor load..... 380 "

Total amperes for which feeder must provide 832 "
Size of feeder 1,500,000 c.m. R.C.

When No Single Motor Exceeds in Capacity 50% of the Balance of the Motor Load on the Feeder

29. This condition can be illustrated by taking the same installation as used previously with the exception that there is no 150 horsepower motor in this case.

30. The groups are therefore the same, the demand factors in each case the same, and the average demand factor is the same.

31. This time the largest motor in the group is a 50 horsepower motor, and the starting current for a 50 horsepower motor is 154 amperes.

32. The current value for determining feeder size is 154 amperes for the 50 horsepower motor, plus the full load current value of the remaining motor load on the feeder which is 567 amperes, giving a total of 721 amperes.

33. It has previously been determined, however, that a demand factor of 55% will be permitted on this installation, and the current for which the feeder must be selected will be $721 \times .55$ or 397 amperes.

Size of feeder — 500,000 c.m. R.C.

Feeder Sizes for Groups of Less Than Five Motors

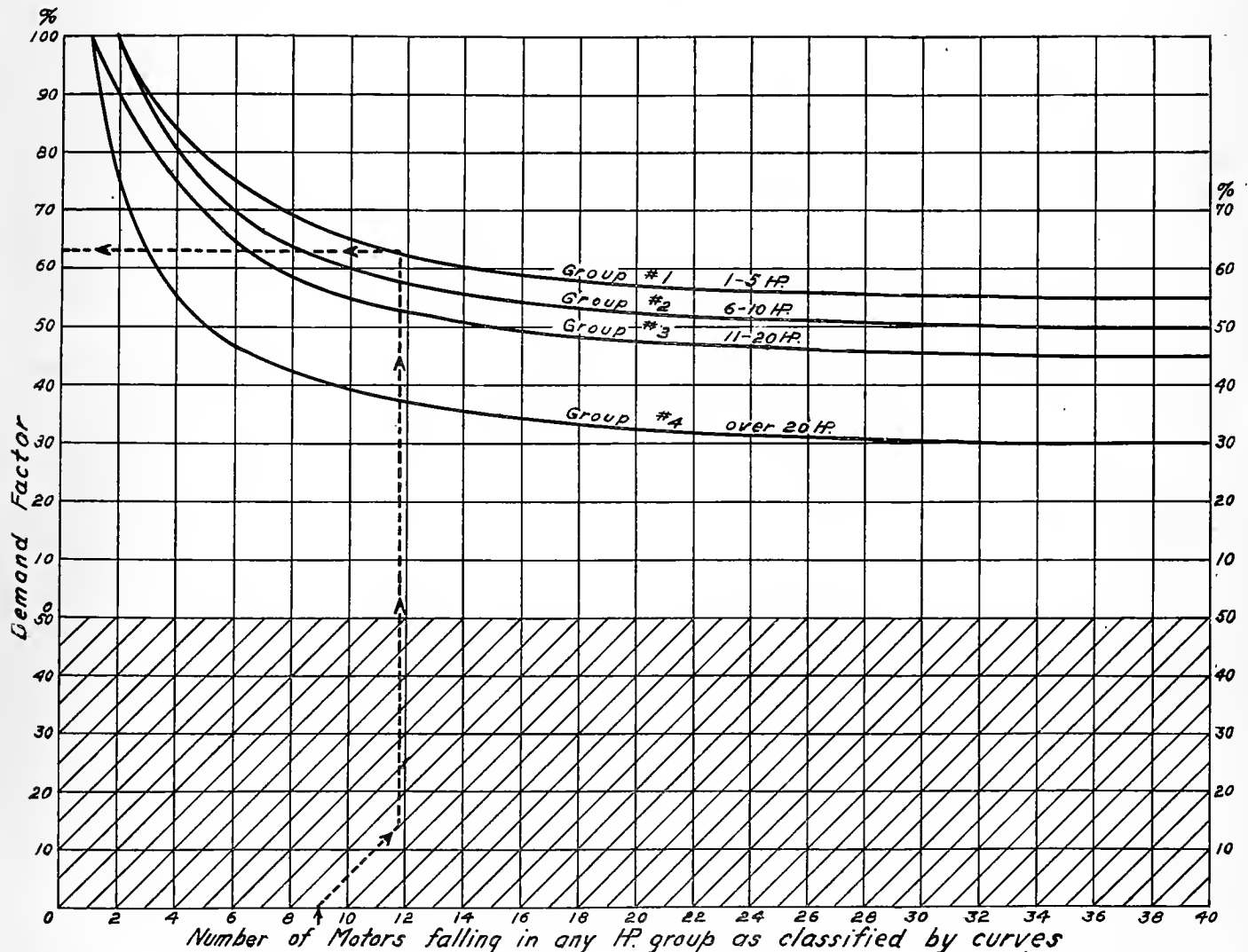
34. The size of feeder for a single motor is given in the Tables of Motor Data.

35. For two, three or four motors the following method may be used: Take the sum of the rated

horsepower values of the motors on the feeder, refer to the Tables of Motor Data, and select the first standard size of motor of the same type next lower than the aggregate value for the group. The size of feeder given in the Tables for the standard size of motor may then be used for the group.

36. To explain more clearly the method defined in the preceding paragraph, the following example is taken. Suppose it is desired to determine the size feeder necessary to supply the following 220-volt, 3-phase, alternating current motors: 1—25 h.p. motor, 1—10 h.p. motor and 1—7½ h.p. motor. The sum of the rated horsepower values is 42½ h.p. Referring to Tables of Motor Data in Addenda to Electrical Code, City of Portland, Oregon, the first standard size of motor next below this summation value is 40 h.p. The size of feeder for this size motor is No. 0 wire. If the motors to be supplied had been 1—20 h.p., 1—10 h.p. and 1—5 h.p. the sum of their values will be 35 h.p. and from the tables we find the size of wire for a 30 h.p. motor—the next standard size below 35 h.p.—is No. 1 wire.

37. Permission to take advantage of this reduction in size of feeder cannot be granted where it is evident from the nature of operation of motors that such a feeder size would be too small to permit proper fusing.



DEMAND FACTOR CURVES FOR MOTOR FEEDERS

Here is a series of curves for determining the size of motor feeders in buildings that have been adopted by the Electrical Board of Appeals at Portland, Oregon. The conditions governing the application of these curves, described in this article, should prove helpful in other localities of the West.

The Plotting of the Demand Factor Curves

Curves in the upper portion of the chart for Demand Factor are plotted from the following values obtained from the Chicago Edison Company, and checked by the experience of the Portland Railway, Light & Power Company.

DATA FOR PLOTTING DEMAND FACTOR CURVES

H.P.	No. of Motors	Points on Curves	Chicago Edison Demands Measured
1 — 5	1	100	86.
	2	100	69.
	4	84	83.
	8	69	66.
6 — 10	1	100	65.
	2	100	67.
	4	81	82.
	8	64	62.
11 — 20	1	100	62.
	2	90	66.
	4	75	69.
	8	59	63.
Over 20	1	100	53.
	2	75	37.
	4	56	53.
	8	43	45.

The lower curves are imperial and derived in order to consider "groups" of motors.

HOW TO SPLICE ROPE

The following directions for making splices in ropes are taken from a circular issued recently by the National Safety Council:

Short Splice (see Fig. 1). First unlay the strands of each rope to a convenient length and butt together the rope ends (see Fig. 2) having each strand of one rope lie between the two consecutive strands of the other rope. The strands of one rope should be drawn along the second rope and grasped in one hand. Then weave the free strands of the second rope in the strands of the first rope, working in a direction opposite to the twist of the rope. Similarly weave the strands of the first rope, and after continuing the process as far as desired, cut off the loose ends of strands. By cutting out a few fibers of a strand each time it is worked through the rope, the splice may be neatly tapered. The splice should be made smooth and compact by rolling under the foot or a board.



Fig.1
Short Splice



Fig.2
Starting a Splice

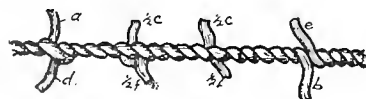


Fig.3 Long Splice



Fig.4
Eye Splice

Figs. 1-4.—Methods of Making Splices

Eye Splice (see Fig. 4). Unlay the end of rope to a convenient length. Pass a loose strand between strands of the rope at a point that will make the proper sized eye. Pass the other loose strands between adjacent strands of the rope and proceed as in making a short splice.

THE CONTRACTOR-DEALER IN CALIFORNIA

BY R. M. ALVORD

(The first number of the "Bridge," an interesting trade publication recently initiated by the General Electric Company, contains a stimulating record of achievements made by the California Contractor-Dealers. The author is supply manager for that company in San Francisco—The Editor.)

In the early days of the California Association of Electrical Contractors and Dealers we heard much discussion on what various people—the central stations, the jobbers, the manufacturers—were going to do for them, but that soon gave way to more serious and thoughtful discussion on "What can we do to make our business better?"

The practice, more or less general, of doing the job as cheaply as possible was discussed pro and con, and many were convinced that in the building of a successful business the best policy is to figure on a quality job—one that will give the user the most service for his money and work fully as good as figured. The user, once shown that the quality job will give a service not to be had from cheap installations, is usually not a shopper for the cheapest possible jobs.

Then that important question "Costs" has been studied, analyzed, and reviewed. A thorough knowledge of costs including labor, material, and overhead and all that goes into it enables the contractor to give an accurate and fair price on the quality job, and is not, therefore, influenced to "skin" the job to save himself from a loss on a job underestimated.

On the retail sales end we find improvements even more apparent. The character of the store in which the woman is to purchase her lamps and appliances has received much attention, and there are now in California many neat, attractive, well arranged electric shops, while the number of similar shops in the first year of the Association work could have been counted on the fingers of one hand. Practically all have improved, some even to the extent of new store fixtures throughout. With the question of store arrangement there has been considered the important one of location; the value of a main street location has been more generally recognized.

After providing an attractive store in a good location comes the problem of bringing in the buyers, selling to them, and having them come back again. Here all phases of retail selling and advertising have been studied, particularly the value of the show window; the value, or rather lack of value, of the ordinary announcement card used by many dealers in their newspaper advertising; the necessity of being liberal—a little more than fair in the adjustment of purchasers' complaints; and the training of themselves and their sales force to give service to the shoppers by showing them how the electrical appliances will serve them.

Thus in buying wiring or appliances the public, better served, better pleased, is more willing to pay a fair price for good electrical service and more of it, and a greater use of electricity is promoted. The contractor-dealer thus becomes a more effective ally of the central station and, receiving a fair price including a proper profit for his wares and work, he keeps his finances in better shape and becomes a financially stronger, as well as a larger, purchaser.

TECHNICAL HINTS FOR BUSY MEN

DEPARTMENT CONDUCTED BY GEORGE A. SCHNEIDER

(A good motor and the best of wiring may leave the customer dissatisfied, if pulleys of the wrong size have been sent. The proper length of belting, speed of the motor, suitable foundations and other factors for which the contractor is responsible are often the determining factors in the success of the installation. A table of corresponding sizes, a formula for determining diameters and rules for other elements involved are here given for practical use.—The Editor.)

APPLICATIONS OF MOTORS TO PISTON PUMPS AND PUMP JACKS

A well known instructor and engineer once made the statement that electrical engineering is 90 per cent mechanical. This fact is pretty well proven in connection with many applications of motors and a great deal of trouble and expense would be eliminated if motor installations were more frequently considered to be a mechanical problem as well as an electrical one. No matter how carefully the motor and controlling devices have been selected and how well the wiring has been done, the installations will not be satisfactory unless suitable methods of transmitting the power of the motor to the device or machine to be driven have also been chosen. This latter factor represents the mechanical part of the problem. It involves the selection of the most desirable speed of the motor, the proper size of pulleys for both motor and driven machine, the proper length and kind of belting, suitable foundations and several other factors which are very frequently given little attention in making motor applications. Some of these factors and their relation to the application of motors to piston pumps and pump jacks will be briefly discussed, particularly those points which are most often brought up by the electrical dealer and contractor.

Generally the troubles experienced result from a desire to use 1800 r.p.m. motors to keep the first cost down to the minimum and a failure to recognize the fact that there is a minimum safe diameter of pulley for every motor depending upon the size, speed and design and that pump jacks and piston pumps are inherently slow speed devices.

A typical pump jack designed to permit the common form of pump which is ordinarily operated by hand or a wind mill to be driven by a belted motor or any other belt power is illustrated in Figure 1. These jacks are usually limited to 25 to 40 strokes per minute ; 35 strokes being a safe average. Speeds higher than this soon ruin both pump and jack and are not recommended. The driving shaft is usually back geared

5 to 1, 6 to 1, or 11 to 1. This means that with 35 strokes per minute the speed of the shaft and therefore of the jack pulleys will be 175, 210 or 385 r.p.m. respectively for the ratios just given.

Assuming that a motor having a full load speed of 1750 r.p.m. has been selected, this will mean a reduction between the motor pulley and pump pulley of 10 to 1, 8.3 to 1 or 4.5 to 1 depending on the gear ratio of the jack. This requires that the jack pulley shall then be 10, 8.3 or 4.5 times the diameter of the motor pulley to keep the number of strokes at 35 per minute. However the maximum ratio of reduction which may be used and give satisfactory results depends upon the power to be transmitted. For good practice the following reductions for belt drive should not be exceeded:

H.P. of Motor.	Ratio of reduction.
½ to 1 inclusive	10 to 1
1½ to 5 inclusive	8 to 1
7½ to 10 inclusive	6 to 1

These recommendations will be found in several handbooks but several authorities limit the reduction for motors 1 h.p. and larger to 6 to 1 in any case. The best results will be secured by working within this limit.

With any ratio selected the size of pulley on the jack will depend upon the minimum diameter of pulley permissible on the motor. Where this diameter is smaller than a certain minimum, there is danger of injuring the bearing and shaft due to the heavy belt tension that would be necessary to transmit the full output from the motor. The standard size and minimum diameter of pulley allowable on a certain line of alternating current motors is as follows:

H.P. of Motor.	Full Load Speed	Standard Pulley.		Special Pulley.	
		Diam.	Face.	Minimum Diam.	Maximum Face.
½	1700	3½	2½	2	3½
½	1120	3½	2½	2	3½
¾	1700	3½	2½	2	3½
¾	1130	4½	2½	2½	4½
1	1700	3½	2½	2½	3½
1	1130	4½	2½	2½	4½
2	1700	4½	2½	3	4½
2	1130	4½	3½	3	4½
3	1720	4½	3½	3	4½
3	1135	4½	4½	3½	6
5	1730	4½	4½	3½	6
5	1140	5½	4½	3¾	7
5	855	7	5	4½	8
7½	1740	5½	4½	3¾	7
7½	1150	7	5	4½	7
7½	865	7	5	5	7

The standard pulleys will vary some for the different lines of motors, but the smallest allowable size is very much the same for all motors of a corresponding size and speed, so the above minimum diameter will be fairly safe for any make.

With these facts and limitations as a guide let us

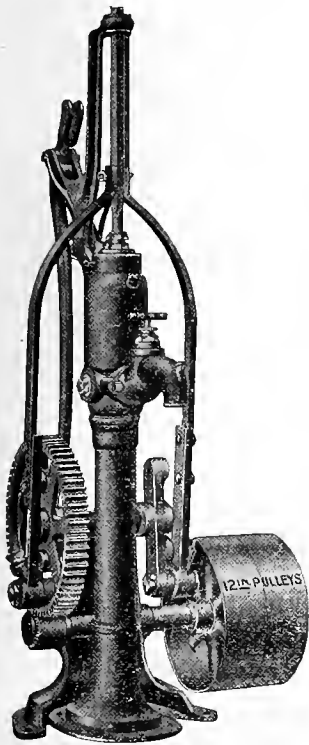


Fig. 1. Typical pump jack, back geared 6 to 1

apply them to an actual installation which came to the writer's attention several days ago. A customer ordered a pump jack specifying the catalogue number of a well known make which was shipped as ordered. Later on this same customer ordered a 2 h.p. 1800 r.p.m. single-phase motor which is regularly equipped with a 4½ inch diameter pulley. Later a special 3½ inch diameter pulley for this motor was ordered. Since the orders for pump jack and motor came in at different times they were not associated with each other and the question as to whether or not the two would work together was not brought up. However, a few days later the customer called by telephone and claimed that the wrong pump jack had been sent because the pump jack made about 70 strokes per minute which was of course too fast.

Investigation proved the jack as ordered had been shipped and further that it was equipped with a 14 inch diameter pulley and was back geared 6 to 1. With a 3½ pulley on the motor having a load speed of 1750 r.p.m. the jack speed would be practically 73 strokes per minute. The jack was finally exchanged for one equipped with a 12 inch diameter pulley and back geared 12 to 1. With the same motor pulley this gave the pump about 42 strokes per minute which was satisfactory.

It is apparent that to keep the speed of the original jack down to 42 strokes per minute it would need to be fitted with a 24 inch diameter pulley which was larger than could be applied to the jack without building a special structure to raise its base several inches above the floor level. It will be noted from Figure 1 that only a small increase in the diameter of the pulleys is possible without raising the jack above the floor level. It is better to use a jack with a higher ratio, say 11 or 12 to 1, but still better to use the lower ratio jack, that is 5 or 6 to 1 and a 1200 r.p.m. motor. In the long run such an equipment will give the best results.

A general rule is that motors of about 1750 speed can be used only with jacks of the larger ratio—11 or 12 to 1, while motors of about 1150 r.p.m. are generally satisfactory for reductions ranging from 4 to 1, to 6 to 1. Piston and plunger pumps work in most cases at slower speeds and slow speed motors either about 1200 or 900 r.p.m. must be used for the best results.

The correct diameter of pulley for the jack or the motor when the speed of the motor, the gear reduction and the number of strokes desired are known may be calculated from the following simple rules:

Let R = ratio of reduction in jack.
N = number of strokes per minute.
S = revolutions of motor at full load.
D = diameter of pulley on jack.
d = diameter of motor pulley.

$$\text{Then } d = \frac{N \times R \times D}{S} \quad (1)$$

$$D = \frac{S \times d}{R \times N} \quad (2)$$

Example.—A piston pump back geared 12 to 1 is fitted with a 12 inch diameter pulley. What will be the diameter of the motor pulley to give the pump 42 strokes per minute if the full load speed of the motor is 1750 r.p.m.?

By formula (1)—

$$d = \frac{42 \times 12 \times 12}{1750} = 3.5 \text{ inches, practically.}$$

In most instances it will be found that a special pulley on either jack or motor will be required to give the correct number of strokes. Since it is cheaper and almost always more convenient to change the motor pulley, the proper procedure is to first determine the minimum diameter of motor pulley that can be used after having found the size of motor needed under the conditions. Then find the diameter of the jack pulley from formula (2). Even with the smallest allowable diameter pulley on the motor in many instances the jack pulley must also be increased in diameter when a high speed motor is used. When the motor pulley is decreased from its standard diameter the width of the face should be increased in the same proportion so a wider belt may be selected to compensate for the loss that would otherwise result from the lower belt speed.

Assuming that the proper diameter pulleys have been chosen, care should then be taken to secure a proper distance between pulleys. This distance should be sufficient to allow a gentle sag of the belt when it is in motion. There are a number of arbitrary rules for determining this distance. One of them, which is probably quite conservative and safe, states that the distance between centers shall be not less than 5 times the diameter of the largest pulley except when there is a very large ratio of reduction. Distances determined by this rule will generally be satisfactory for practically all installations involving pump jacks or small pumps since the amount of power involved rarely exceeds 5 h.p. Single-ply leather or three-ply rubber belts will be required for most of these installations because it is not advisable to use double-ply belts with pulleys of less than nine inches in diameter, and one of the pulleys will usually be smaller than nine inches.

The pulley face should exceed the belt width by approximately the following amounts:

1 in. to 2 in.	by ¼ inch
2 to 5 inches	by ½ inch
5 to 12 inches	by ¾ inch

From the electric standpoint, the principal points involved in making installations of this kind are the selection of a motor of the proper size and starting characteristics, and suitable protective and controlling devices. Except in special cases, the motor selected should be large enough to permit the pump to be operated continuously without overheating of the motor. It is not good practice in these installations to adopt a smaller motor and depend upon the overload capacity and the intermittent nature of the service to prevent overheating in the motor. In selecting motors based on the intermittent duty rating there is always the danger of choosing a rating too small for the work and therefore possibilities of overloading the motor.

When single-phase motors are used for these installations they should be of the repulsion-induction type on account of the high torque developed at starting.

WOMEN IN THE INDUSTRY

A WOMAN ELECTRICAL DEALER

BY LILLIAN PALMER

(How a woman in the electrical industry has been able to overcome unfair conditions, form a stock company and interest her workers in the enterprise is graphically told in this article. The author is one of the best informed people in San Francisco on electrical fixtures, for she has studied them from an artistic, an engineering and a commercial standpoint.—The Editor.)



An attractive portable fixture

HERE is a little electrical fixture shop on Sutter Street near Van Ness Avenue in San Francisco which is known as the Palmer Shop. It is a woman's idea of how to handle the problems of an electrical dealer. The back of the establishment, to be sure, is given over to the making of the fixtures sold in the front salesroom, but aside from the manufacturing side of the business, the factors of

location, of overhead, of advertising, the questions of display rooms and of reaching the avenues of trade are much the same as those met by any dealer in electrical goods.

The shop is not located on a main street nor does it present the appearance of an ordinary store. The idea throughout has been to follow the example of European metal shops in quaintness and attractive appearance. The primary object in securing the rather rough looking building was the lowness of the rent—and the smallness of this factor in the overhead makes much possible in the keeping down of prices. The rustic and hand wrought appearance of the front, however, has proved to be perhaps the main attraction of the shop.

The display window and salesroom are effectively combined in the burlap walled room which occupies the extreme front of the building. This is shallow enough to give the effect of a model room designed for the window shopper, and yet deep enough to serve for a salesroom to display fixtures to the actual purchaser. The idea throughout is to give the effect of an unusually attractive interior made so by the electrical fixtures used and care is taken that this display space be never overcrowded.

This is a woman's store, but the problems of securing help and of gaining their co-operation are no different than if I had been a man. I myself had begun my business career in a newspaper office and then as editor of a small magazine. Although I soon took over the writing of editorials, advertisements and even fiction so that other writers could be dispensed with, my salary was but sixty dollars per month. The man

who held the job ahead of me received one hundred and fifty and he was discharged for incompetency! Right here, as an employer, I drew a lesson. In these days of close competition, when highest efficiency is a term on every lip, I realized that there is no greater leak in any office than a poorly paid employee. No motorist is going to drive a car if he can help it unless every cylinder is giving its full quota of power and the discontented man or woman is a knocking cylinder which, even in a large shop, may retard the smooth going of the whole machine.

I had been experimenting with metal work in spare hours and now, finding that the business could be made really profitable, turned to that entirely. Two years of independent work, of giving lessons—and a study trip to Europe brought me to the point where I was ready to open a business for myself.

I arrived home determined to put my knowledge to practical use by opening a shop such as some I had seen abroad where, by proper management, I thought individual work could be put on the market at a price within the reach of the average buyer.

Of course there was only one place to put my plans into action so I came to San Francisco with one order, a very light purse, a heavy box of tools and an ignorance that embraced every department of business, from credit and buying down to figuring on my own work. On looking back at my assets I am not sure but the ignorance was the most valuable of all, for it led me to carry to a successful finish things that no wise person would ever have attempted. Each day was so crowded with new mistakes to be made that I never made the same one twice; and I began to demonstrate that my theory was correct and that there is always a place for work that is out of the ordinary.

Each job brought others and with increasing work came the necessity for first one assistant and then others, both men and women, so, remembering my ancient grudge against unfair conditions, I formed a stock company, each worker receiving a fair salary and a certain proportion of stock. The plan has worked splendidly. Customers very often comment to me on the atmosphere of vitality and cheeriness in the shop, and the great amount of work turned out; it is because happiness is the greatest constructive force in the world. Another thing we have proved is that good work is a sexless thing. Any one buying a lamp from us does so because workmanship and design please him and he doesn't stop to ask if it has been made by a man or a woman. As a matter of fact it may have been done by either one or the other, or by both, according to whose time it fitted.

With the growth of the work, there arose another interesting complication: I discovered that there is another side to the electric fixture business beside good design, the engineering side. Indirect lighting had come in, with its accurate harnessing of light so that shadows may be placed just where a proper perspective requires. I was fortunate enough to secure the interest of a good engineer who not only lent me

books but personally superintended several jobs and even gave a stereopticon lecture to us all so that the workers knew what to avoid in making and hanging fixtures. And then for me the subject broadened even further:—there was the human eye to be considered and the effect of bad lighting upon the general health—an effect given by no means its rightful importance by the average designer. So I took a few lessons with a good oculist and learned not to throw brilliant lights on a white table cloth and not to tantalize a poor over-worked eye with a succession of deep shadows and unshaded lights.

The policy of the Shop has been from the first an insistence on the enthusiastic customer; mere satisfaction is not enough. It has not always meant money making for it has sometimes entailed endless exasperating changes that have eaten up profits. But it has been good advertising. We have done no single job, not one, that has not brought other work, often far removed from it, until now the Shop ships fixtures all over the country, two big orders going to the heart of New York City.

I think one great reason for our success is the personal consideration given not only to each house, each room, but where possible, to each occupant of the room. Not only is the decoration and coloring taken into consideration but the makeup of the family and their mode of life. Often as we discuss rugs and hangings and whether the maid will be exchanged for a Japanese boy—all intimately bearing on the choice of fixtures—a customer will exclaim, "Oh, why don't all electric fixture stores have women do the selling?"

One of my most difficult tasks has been in making the average owner realize the importance of correct lighting fixtures; that the whole character and livableness of a room may be militated for or against. Of course architects do know this and an increasing number of them are coming to us to put their own designs into metal, which our low overhead makes possible for the average client. Another branch of work that has rapidly grown is the lighting of houses built for sale, for builders have discovered that when a buyer is undecided between several houses her decision is almost invariably swayed by the house with individuality shown in electric fixtures. A great variety in colors and softness of light is obtained by a metal tapestry, an invention of the Palmer Shop.

Such is the history of the Palmer Shop up to date. when we like all other manufacturers, stand confronted with the greatest war the world has ever known and with conditions changing every day. One of our men has enlisted, another has gone to work for the Government. I think the answer will be more women, for we have already proved their efficiency, but, also like other manufacturers, we can only say — *quien sabe?*

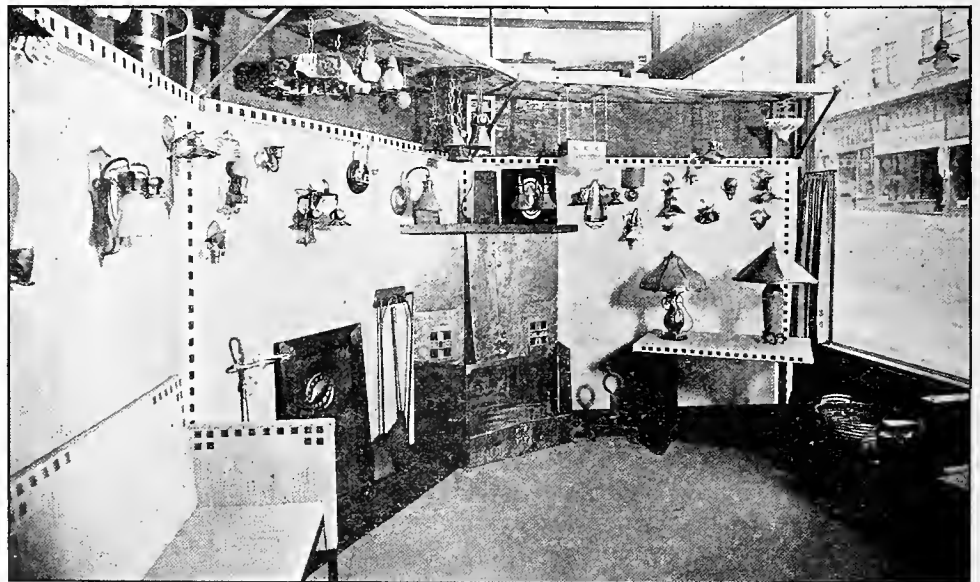
HIGHER POSITIONS FOR WOMEN

Women not only serve as operators with the New York telephone company, according to a recent article in the Bulletin of the League of Business Opportunities for Women, but the higher positions are open to them as well. The salaries of women in the telephone company's Traffic Department range from \$9 a week to \$35, and in some cases even higher. That the business woman there finds opportunity for more important work and accepts it is shown by the gradual rearrangement of the organization of the central office forces. In the early years each central office had a manager, an assistant manager and a chief operator, and manager and assistant were always men. Today, most of the central offices are in charge of women chief operators, who conduct the work with the aid of women assistants such as Supervisors and Senior Operators.

Besides the positions named above, the telephone company is opening up a few specialized positions to women and has already welcomed into its organization a number of college graduates.

GROWING NUMBER OF WIVES ARE WAGE EARNERS

More than one-tenth of the married women of the United States were engaged in gainful occupations in 1910, according to figures recently given out by the Bureau of the Census, and over 25 per cent of all women 16 years old or over were wage earners, busi-



INTERIOR OF THE PALMER SHOP

This artistically designed front room serves as show window and salesroom as well. There is no effect of crowding here and yet fair samples are given of the stock stored away in the rear.

ness women, etc. Since 1910 the percentages undoubtedly have increased rather than diminished, for the tendency of women in this country has been toward greater economic freedom for many years. In 1900 the number of married women in gainful occupations was only 769,000, while in 1910 it was 1,890,000. The statistics referred to show that the proportion of women—married, single, and widowed—who are earning their living, is greater than ever before, but it is particularly interesting to find that of all the groups cited, the proportionate increase in the number of married women is the greatest.

FEMALE LABOR QUESTIONNAIRE

The National Commercial Gas Association, in co-operation with the Merchants' Association of New York, is seeking all possible information which may be of value to employers who are confronted with the problem of substituting female for male labor because of the present scarcity of male labor. In connection with this the N. C. G. A. is sending the following questionnaire to gas companies:

1. Have you had to substitute female labor for male labor to any appreciable extent? If so, what kind of work and to what extent?
2. Do you expect to be compelled to make such substitution in the near future?
3. Does substituted female labor receive the same compensation as the men formerly filling the positions, for the same amount of work, and how does the amount produced by women compare with the output of the men?
4. Has your experience given you any opinion relative to the type of work on which female labor can be substituted most satisfactorily?
5. Has your experience shown you any special problems arising from the substitution of female labor?
6. What has been the quality of the male applicants applying for positions with your company recently, and how do they compare with the men leaving your organization?

ENGLAND AND THE WOMAN SITUATION

The war has wrought great changes in the labor situation of the United Kingdom, but no factor is more outstanding in importance than the extension in the employment of women. The following figures, which are based on returns made by British employers to the Board of Trade, show the increase in numbers of women engaged in various activities which has taken place since July, 1914, and also the number of women who have directly replaced male employees:

Occupation.	Estimated number of females employed in July, 1914.	Increase Direct re- up to placement April, of men by 1917. women.
Industries	2,184,000	453,000
Government establishments	2,000	198,000
Agriculture in Great Britain (per- manent labor)	80,000	32,000
Transport	19,000	62,000
Finance and banking	9,500	50,000
Commerce	496,000	307,000
Professions	67,500	21,000
Hotels, public houses, cinemas, thea- ters, etc.	176,000	13,000
Civil service	66,000	89,000
Local government	198,000	47,000
Total	3,298,000	1,240,000

Thus the total number of female laborers is now 4,538,000. While the greatest number of women are employed in industrial work, the largest percentage of increase has taken place in Government offices,

where only 2,000 women were employed in 1914, as compared with about 200,000 at the present time, a gain of 9,900 per cent.

Of the 4,538,000 women now employed in all branches, over one-half, or 2,637,000, are engaged in industrial occupations, and these are divided among the various industries as follows:

Trades.	Estimated number of females employed July, 1914.	Increase (+) or decrease (—) from July, 1914, to April, 1917.
Metal	170,000	+ 308,000
Chemical	40,000	+ 51,000
Textile	863,000	+ 22,000
Clothing	620,000	+ 37,000
Food	196,000	+ 18,000
Paper and printing	147,500	+ 7,000
Wood	44,000	+ 24,000
All other trades	103,500	+ 74,000
Total	2,184,000	+ 453,000

CALL FOR WOMEN STENOGRAPHERS

The United States Government is in urgent need of thousands of typewriter operators and stenographers and typewriters. All who pass examinations for the departments and offices at Washington, D. C., are assured of certification for appointment. Women especially are urged to undertake this office work. Those who have not the required training are encouraged to

undergo instruction at once.

Examinations for the Departmental Service, for both men and women, are held every Tuesday, in 450 of the principal cities of the United States, and applications may be filed with the Commission at Washington, D. C., at any time.

ELECTRICAL TERMS ILLUSTRATED—I

If the woman in your employ becomes upset—



WHAT WESTERN INVENTORS ARE DOING

(If you have an idea, what should you claim in your patent so that no one may infringe on your rights? If the other man has a patent, how much has he left open for you to use? Questions of this sort and others relating to patents and inventions are considered in this interesting article. The authors are members of the firm of Prost and White, prominent patent attorneys of San Francisco.—The Editor.)

NOTES ON THE LAW OF PATENTS

BY WM. K. WHITE AND H. G. PROST

Invention

An invention is an idea of means for accomplishing an end. The inventive act is completed when the mental conception of an idea of means is followed by the embodiment of such idea of means in concrete form. Such concrete embodiment of the idea of means is termed a "reduction to practice" of the invention. The filing of a patent application is called a "constructive reduction to practice" of the invention disclosed therein and, for some purposes, is deemed the equivalent of an actual reduction to practice.

There is no idea that cannot be verbally expressed in a number of ways, each expression thereof being the equivalent of every other expression of the same idea. This is universally true. For instance, the idea that an object is round can be expressed in a number of ways. The same idea may be expressed thus: "Every point on the object's surface is equally distant from the center of the object." The same idea may be expressed in any of the foreign languages.

It follows there can be no generic expression of a generic idea. Every expression of a generic idea is only one of many possible specific expressions of such idea.

The foregoing is true in connection with practically all mechanical inventions which may be expressed by the use of mechanical elements. Where an inventor conceives an idea of means, it is almost always possible to express said idea of means in many different concrete forms, each the equivalent of every other. For instance, an inventive idea of means might be expressed or embodied in a machine, in which a weight is used for returning a movable part to normal position. However, such specific embodiment of the generic idea of means would constitute only one species of the invention. It is obvious that, in most cases, a spring could be substituted for the weight to perform precisely the same function in the machine. The machine, with a spring so substituted therein for the weight, would constitute another species of the generic invention.

In the law of patents, said weight and spring would be termed "mechanical equivalents"; and the machine, with the weight therein, and the machine, with the spring therein, would be equivalent expressions or concrete embodiments of the same inventive idea of means.

Letters Patent

The value of a patent, on an invention, depends on whether or not it covers the actual invention, in whatever form it may be expressed or embodied. The patent may be so worded as to cover only one of many forms, in which the invention can be embodied. In such a case the inventor practically dedicates to the

public his whole invention, because the public, without infringing the patent, may freely use the invention when expressed or embodied in any of the equally valuable forms not covered by the patent.

From the foregoing, it will be seen that an inventor may make an invention of great value and yet fail to derive any profit therefrom by reason of filing a patent application so drawn as to cover only one specific embodiment of his broad invention.

The commercial value of a patent, therefore, depends upon two factors:

1. Upon the commercial value of the actual invention disclosed therein in respect to supplying a public want or need.

2. Upon the patent covering, and protecting the actual inventive idea of means in every equivalent form in which the same can be embodied.

A patent on an inventive idea of means, capable of embodiment in a machine, comprises a document containing:

1. Drawings illustrating one form of machine in which the invention may be embodied. (Note: The Patent Office Rules do not permit one to attempt to illustrate all or a number of the various modified forms of machines in which the invention can be embodied.)

2. A specification constituting a description of the machine, shown in the drawings.

3. Claims.

Claims

The "claims" are the most important part of a patent. The breadth and scope of the monopoly, granted by the patent, depend upon the wording of the claims. The claims define the metes and bounds of the invention of which a monopoly is granted to the inventor.

A patent grants a monopoly of only that which is claimed. A deed to land grants only that which lies within the metes and bounds set forth in the deed.

A patent may disclose, in the drawings and specification thereof, a broad, pioneer invention. However, the monopoly, granted by such patent, may be only one specific embodiment of such invention, by reason of the inventor failing to claim all that he was entitled to claim.

A chain is no stronger than its weakest link; a patent claim is no broader than its narrowest limitation.

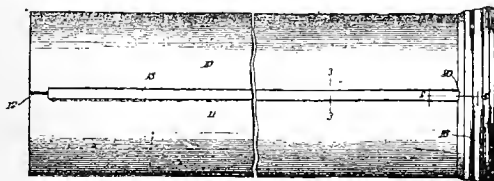
What can be but is not claimed in a patent, is dedicated to the public.

Each claim of a patent is, in effect, a patent on the subject matter thereof. One claim may be valid and another claim, in the same patent, be invalid. One claim may be infringed and another claim, in the same patent, be not infringed by the unlicensed manufacture, sale or use of a particular machine.

New Ideas from the West

Patent No. 1,240,957. **Manufacture of Cylinders, Pipes, etc.** William A. Doble, of San Francisco, assigned to Pelton Water Wheel Co.

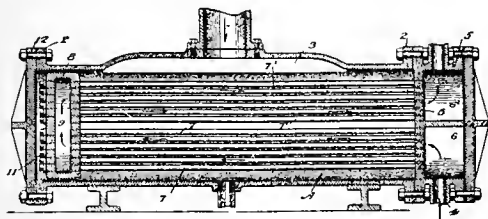
This patent covers a joint construction for securing together two pieces of metal or the opposite ends of a single piece of metal and while it appears simple, the issuance of



the patent is evidence of its novelty. In this invention, the two adjacent edges of the metal are butt-welded together and a strap is laid over the butt joint and welded at the butt joint and also welded to the plates at the edges of the strap forming three parallel lines of welding which insures a strong and tight joint.

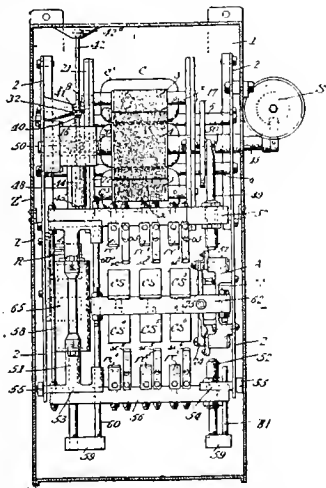
Patent No. 1,241,190. **Feed Water Heater.** Carl F. Braun, of San Francisco.

This invention comprises a shell, having a detachable partitioned feed head arranged at one end and a floating head arranged at the other end. The two heads are connected by nests of tubes seating in the inner walls of the heads and means are provided for allowing ready access to the tubes



for the purpose of cleaning, by providing a removable outer end on the feed head and providing the outer end of the floating head with openings which register with the tubes, the openings being normally closed by removable screw plugs.

Patent No. 1,240,877. **Controlling Mechanism for Electric Motors.** Cleveland Redfield, Ogden, Utah.

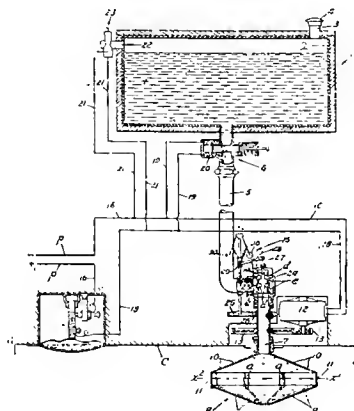


This invention relates to a controlling mechanism for alternating current motors and judging from the number of claims which have been allowed, the mechanism must possess

considerable novelty. The mechanism embodies a compensator comprising coils and a variable magnetic circuit, a switch for placing the coils in circuit with the motor to be controlled, means for varying the magnetic circuit, and a mechanism for controlling the speed at which the magnetic circuit is varied.

Patent No. 1,241,450. **Rotary-Sprinkler Thermostatic Fire Extinguisher.** H. F. Taylor, Los Angeles, California.

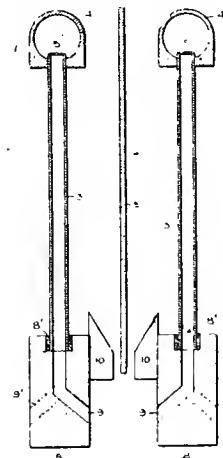
This invention relates to the automatic type of fire extinguishing sprinklers, which are thrown into operation by an abnormal rise of temperature. The sprinkler head is connected to the water supply pipes and is provided with a small motor for rotating it. The flow of water through the pipe is



controlled by a valve which is operated by a solenoid. The solenoid and the motor are connected in parallel to the supply leads, in one of which is arranged a contact-making thermostat. When the temperature rises above the predetermined maximum, the thermostat operates to close the circuit, energizing the solenoid and opening the water valve and simultaneously energizing the motor which rotates the sprinkler head. A governor is also provided for regulating the flow of water through the pipe.

Patent No. 1,241,967. **Electrolytic Apparatus.** Herbert R. Hanley, Winthrop, California.

The object of this invention is to provide means for brushing off the gas bubbles which adhere to the cathode in an electrolytic cell. To accomplish this, the anode is made



hollow and is provided with ports on its lower end, which lies adjacent the cathode, and gas is blown through the anode and the bubbles ascending through the electrolyte impinge on the cathode and brush the adhering bubbles from the cathode.

SPARKS—Current Facts, Figures and Fancy

(Electric trucks are already in use in New York for the delivery of mail, and now the Post Office Department is considering the use of trucks to handle the parcel post problem in rural districts. With the present necessity for the conservation of gasoline, a fruitful field seems to be opened here for the electrical vehicle. Most of the items of interest have a tinge of war coloring.—The Editor.)

Some farmer has invented a way of killing rats by attaching a hose to the exhaust pipe of his automobile and forcing the fumes down the rat holes. Another case of using the waste products.

* * *

We are getting used to the illuminated flag at night standing out against the sky. A miniature searchlight attached to the automobile hood to illuminate a miniature flag is the latest in electric devices.

* * *

Not only will this year's coal production exceed that of last year by 10 per cent, but it will exceed that of two years ago by 23½ per cent. These are the figures given Dr. Garfield by Prof. George O. Smith, of the United States Geological Survey.

* * *

Although it rains every day in Panama, the spring of the year is the dry season, October and November holding the worst record. Every month from May to the following January is included among those reported as the four wettest months.

* * *

The migration of 'plants' is now a factor in the electrical industry. An Alaskan power plant used in the coal mines originally came from England across Mexico at the cost of two and a half million dollars. Now it is being dismantled to be shipped to Japan.

* * *

The drawing room in many factories contains old tracings, on tracing cloth, which are of no further use. It is said that any laundry can wash and iron these so that the cloth becomes available for bandages. A company in Ohio has offered to wash such tracings in its shop laundry and turn them over to the Red Cross.

* * *

The first locomotive constructed on the Pacific Coast in a quarter of a century recently made its maiden trip over the Southern Pacific lines, having hauled part of the draft contingent from Sacramento to Oakland and thence to Roseburg, Ore. The locomotive was constructed in the Southern Pacific shops at Sacramento and is of the Pacific type.

* * *

Under a heading "Forty Years Ago Today" the San Jose Mercury-Herald reprints the following item from its columns of that time:

"A demonstration was given at the telegraphers' ball in Chicago, whereby persons actually talked over a wire on what was known as a telephone. It proved a great novelty and wonder."

* * *

About sixty per cent of our coal in this country is consumed by power plants and railroads. This passes through the hands of about two hundred and fifty thousand firemen. If these men were taught

proper economy, Van H. Manning, director of the Bureau of Mines, believes that we could get along with something like half the amount. Another example of saving by pennies mounting into pounds.

* * *

A new opportunity for the electric truck is suggested by the experiments now being carried on by the Post Office Department looking toward increased efficiency in the delivery of mail. A bill has come before Congress to make aeroplanes rejected for war use on account of failure to pass speed tests available for such service. Motor trucks of all types are being considered as well.

* * *

The United States is not the only country which has forbidden exports. The Swedish Government has now prohibited the exportation from the country of all electrical machines such as generators, motors, converters, and transformers, and also parts of such machines, incandescent and arc lamps, carbon and metal filaments, current regulators, telephone and telegraph apparatus, and electro-technical apparatus, such as X-ray machines, wireless telegraphy plant, etc.

* * *

Here is a tabulation of the eight great causes of food waste—made out by the department of health of New York. Note how many of them would apply directly to waste in the electrical industry:

No terminal markets.

Duplication of marketing facilities.

Expensive cartage.

High retail delivery costs.

Unnecessary credits.

Extravagance in service and display.

Failure to buy home-packed goods of equal quality.

Failure of retailer to use proper merchandising methods.

* * *

Now that "summer-time" has come to an end, Germany is organizing new schemes of "daylight saving" for the winter, in order to economize fuel and artificial light. Notice has been given by the General in Command of the Munster Army Corps District that the consumption of gas and electric power in shops, restaurants, and so on must this winter not exceed one-half of the consumption in the winter of 1915-16. All the military and civil authorities, businesses, and other private undertakings are required to alter their office hours, from October 1st onwards, to the time between 8 a.m. and 4 p.m. Schools will keep the same hours. The lighting of shop windows and the use of passenger lifts are forbidden, and all restaurants are to be closed at 9 p.m.

PERSONALS

Lee H. Newbert, formerly in charge of sales for the Pacific Gas & Electric Company, with headquarters at San Francisco, has been appointed to head the commercial department of the company. The change has been brought about due to the resignation of Stanley V. Walton, head of the commercial department, announcement of which was made in the *Journal of Electricity* for October 15, 1917. In future the two departments will be merged into one unit. In the reorganization **L. F. Galbraith** and **R. E. Fisher** will assist Mr. Newbert in his work, in which Mr.



Fisher's activities will in a great measure be concerned with the large power work. Much good for the electrical industry in the West is in store due to the prominence of the men in this department. Both Mr. Fisher and Mr. Newbert are at present most active members of the San Francisco Electrical Development and Jovian League, the former as its first vice-president and the latter as a recent president. The best wishes of men of the electrical industry in the West go with them in their enlarged field of activity.

J. R. Thompson, a consulting engineer of Portland, attended the recent Logging Congress at Seattle.

J. C. Manchester, district sales manager for the San Francisco district for The Economy Fuse and Manufacturing Company, has located at 324 Rialto Building.

J. W. Oberender has again been retained as the secretary-treasurer of the Oregon Association of Electrical Contractors and Dealers and will in the future devote practically his entire time to the Association.

W. C. Wurfel, Pacific Coast manager of the Westinghouse Lamp Company, has recently returned to San Francisco from a visit to Southern California cities and has started on a business trip to Seattle and Portland.

J. F. Fenwick of the Hawaiian Electric Co., Ltd., with headquarters at Honolulu, is a Pacific Coast visitor and an interested onlooker at the recent Beverly Hills Convention of the Pacific Coast Electric Supply Jobbers' Association.

W. B. Hall, of Pass & Seymour, with headquarters at Solvay, N. Y., is an interested Pacific Coast visitor. Mr. Hall was in attendance at the recent Beverly Hills Convention of the Pacific Coast Electric Supply Jobbers' Association.

Samuel H. Taylor, manager of the Electric Railway and Manufacturing Supply Co. and president of the Pacific Coast Electric Supply Jobbers' Association, has left for Hot Springs, Va., to attend the Westinghouse Jobber Agents' meeting.

C. Jones, of the transformer engineering department, General Electric Company, Pittsfield, Massachusetts, is making a tour of the Pacific Coast visiting the district offices of the company at Seattle, Portland, San Francisco and Los Angeles.

Preston S. Millar, general manager of the Electrical Testing Laboratories of New York City, will lecture in Portland Nov. 20, 1917, before the Portland Section of the American Institute of Electrical Engineers on "Illumination as applied to street lighting."

Reuben S. Tour, associate professor of gas engineering at the University of California, has received a commission as first lieutenant in the Ordnance Department of the U. S. Army. Mr. Tour expects to see active service in his new field of duties in the near future.

F. D. Weber, chief electrical engineer of the Oregon Insurance Rating Bureau, Portland, Oregon, recently accompanied the representatives of the State Fire Marshals to the city of Albany as electrical expert, where a discussion had arisen over a report published by the State Fire Marshal's office. All differences were amicably settled.

Guy L. Bayley, who has been engaged on hydroelectric construction work for the Department of the Interior in the Yosemite Valley on the Merced River, has resigned to become assistant to the president of the Federal Export Corporation, 115 Broadway, New York City. Mr. Bayley's immediate work will be to establish the company in the Far East. He left recently for a six months' tour of Japan, Korea, China, Siam, the Straits Settlements, Java, Sumatra and way stations. He has had previous experience in this work, having represented the American Trading Company from 1900 to 1904 in Japan. Mr. Bayley was chief of the mechanical and electrical departments of the Panama-Pacific International Exposition. When the exposition came to a close he opened an office in San Francisco as a consulting engineer. Men of the West wish him godspeed in his new undertakings.

W. C. Wagner, electrical engineer with the Bureau of Standards, Washington, D. C., which is concerned with the standards of weights and measures, qualities of materials, standards of operation as well as standardization of physical constants, was in Seattle recently. He is taking a four months' trip through the West conferring with state commissions and other administrative bodies concerning public utilities in the matter of electrical safety of construction and operation, and incidentally of matters concerning electrolysis. These questions are taken up with public utility heads as well as universities. The trip is a special one and will be extended on down through Oregon and California. He was a guest of Superintendent of Public Utilities A. L. Valentine. Mr. Wagner visited the Seattle Engineers' Club at luncheon where he spoke briefly. He visited the Department of Weights and Measures at Olympia on his way south.

Newcomb Carlton, president of the Western Union Telegraph Company, together with vice-presidents J. C. Willever and W. N. Fashbaugh, and other New York and Pacific Coast officials of the corporation, visited Portland recently and made an examination of equipment and business records. There are few Western Union employees of Portland, other than messenger boys and mechanical men, who did not personally meet President Carlton. The Western Union officials have left for Seattle and Spokane. In the group were these company officials from the New York headquarters: President Carlton, Vice-Presidents Willever and Fashbaugh, Assistant to the President Lewis McKisick, and W. C. Merley, secretary of the party. Pacific division officials who came from San Francisco were: N. T. Cook, general manager; B. L. Brooks, general superintendent of traffic, and J. L. Ord, general superintendent of plant. Seattle district officers with the party were: I. N. Miller, superintendent; W. F. Schwandt, division supervisor of plants, and E. L. Ritter, superintendent of plant.

Fred D. Baker, formerly new business manager of the Sierra and San Francisco Power Company and of the Coast



Valleys Gas & Electric Company, is now captain in the Quartermaster's Department of the United States Reserves, stationed at Fort MacArthur, California. Mr. Baker was the guest of honor at the recent Beverly Hills convention of the Pacific Coast Electric Supply Jobbers' Association and spoke feelingly of his former associations with men of the electrical industry in the West.

Arthur Williams, general commercial manager of the New York Edison Company, was appointed Federal Food Administrator for New York City on October 24th. He will work in close co-operation with the various committees and commissions and the Federal agent for the State in the solving of the food problems of this city. Mr. Williams up to the present has been chairman of the United States Food Administration campaign to enlist New York women as aids to the Food Administrator.

Albert S. Elliot, the widely known secretary of the Pacific Coast Electric Supply Jobbers' Association, has recently completed what is



known as the "Elliot Drive." Not being content with the national reputation he won at the Hot Springs Convention of National Electric Supply Jobbers Association last spring, his admirers have called upon him from time to time to give notable lectures before the San Francisco Electrical Development League, the California Association of Electrical Contractors and Dealers; the Pacific Coast Electric Supply Jobbers' Association; the British Columbia Association of Contractors and Dealers; the Washington Association of

Electrical Contractors and Dealers; the Oregon Association of Electrical Contractors and Dealers; and the Northwest Electric Light and Power Association. While scouting about Pasadena, after the recent Beverly Hills Convention of the Pacific Coast Electric Supply Jobbers' Association, Miles Steel of the Benjamin Electric & Manufacturing Co. and S. B. Gregory of the Arrow Electric Company caught Mr. Elliot with his charming wife and daughter standing over the famous "Elliot Drive" sign in the beautiful residential section of Pasadena, which in view of the coastwise electrical activities of Mr. Elliot seems quite apropos as shown in the photograph above.

Tom Bibber of the Luminous Unit Company of St. Louis, manufacturers of Erascelite ware, is a recent Pacific



Coast visitor. At the recent Beverly Hills Convention of the Pacific Coast Electric Supply Jobbers' Association, Mr. Bibber proved so unique and so entertaining in his rendition of the eloquent man with the artificial arm that he was invited to assist at the Red Cross Smoker of the San Francisco Electrical Development and Jovian League on Nov. 1, 1917. Needless to say his pleasing personality has won for him a host of friends on the Pacific Coast.

R. H. Ballard, vice-president and assistant general manager of the Southern California Edison Company is receiving congratulations from all quarters over the masterly manner in which he recently handled the giant Liberty Loan campaign in Los Angeles and thus brought his section of the state into such favorable comment from all quarters. Incidentally Mr. Ballard acted as toastmaster at the recent Beverly Hills convention of the Pacific Coast Electrical Supply Jobbers' Association. After presenting a majority of the cups for golf supremacy to W. S. Berry, western salesmanager

of the Western Electric Company, who has his headquarters at San Francisco, Mr. Ballard was glad to state that at least one or two cups, due to the exceptional climate of Southern California, had been won by men from Los Angeles and vicinity.

D. J. Butts, of the Western Electric Company at Los Angeles, C. W. Chestnut of the Western Electric Company at Seattle, and R. S.



Folland of the Capital Electric Company at Salt Lake City, illustrated in the snap-shot shown herewith from the golf links at Beverly Hills, are typical instances of how men of the industry from every section of the West came together during

the recent quarterly gathering of the Pacific Coast Electric Supply Jobbers' Association at Beverly Hills.

OBITUARY

George E. Scarfe, the well-known mining engineer and, for many years, power superintendent of the Nevada district of the Pacific Gas & Electric Company, died in Nevada City on the twenty-fourth day of August. Men of the electrical industry generally together with the residents of Nevada City and Grass Valley in particular bemoan his loss.

General H. N. Chittenden, U. S. A., retired, died in Seattle, October 9th. He was an engineer and a member of the Seattle Port Commission during an active construction period. He was the author of a series of articles on port improvements and contributed a notable report to the columns of the Journal of Electricity during 1916 on the Columbia River Report for the development of the water power at The Dalles.

CALIFORNIA WATER COMMISSION NOTES

Applications for water appropriations have been filed with the California State Water Commission as follows:

Thomas O'Brien of Lebec, 50 second feet of waters of Cuddy Creek in Kern county for use on 2500 acres. Applicant proposes two storage reservoirs, with two dams, 20 and 30 ft. high, respectively, and two main ditches a mile and three-quarters of a mile long, respectively. The estimated cost is \$3500. The same applicant has also applied for permission to appropriate the same amount of water from Cuddy Creek, for the generating of energy with which to supply the town of Lebec, for manufacturing and other purposes. The works propose a dam of granite rocks and clay 30 feet high, with a main ditch 3 miles long. The total fall to be utilized is given as 750 ft. and the amount of power to be generated as 3500 theoretical horsepower.

J. Sank of Oroville, 28 cubic feet per second of French Creek in Butte county for the generation of electrical power for mining, manufacturing and other uses. The diversion works consist of a dam, timber crib, fifteen feet in height and a ditch, flume and pipe line $2\frac{1}{2}$ miles long. The total fall to be utilized is 800 feet for the development of 2545 theoretical horse power. The estimated cost is given at \$136,000. The water is to be returned to stream after use.

E. E. Lindsey of San Francisco, 30 cubic feet per second of Buck's Creek, tributary to N. Fork of Feather River, in Plumas county, for the generation of electrical power to supply electro-chemical manufacturing plant. The proposed diverting dam is 20 feet in height, timber crib, rock filled, and there is a flume, ditch and pipe line $3\frac{3}{4}$ miles long. The total fall to be utilized is given at 1400 feet and the amount of power to be developed as 4470 theoretical horse power. Water is to be returned to stream after use. The estimated cost is placed at \$194,000.

MEETING NOTICES FOR ELECTRICAL MEN

(The Southwestern Society of Engineers, a new and enthusiastic gathering of engineers from Arizona, New Mexico and western Texas constitute the most interesting new gathering during the past semi-monthly period. The San Francisco Electric Development and Jovian League and the Pacific Coast Electric Supply Jobbers' Association have also been exceedingly active during this period. Other gatherings of men of the industry are also set forth in the following lines.—The Editor.)

Southwestern Society of Engineers

The Southwestern Society of Engineers on October 18-20, held a most interesting and helpful convention at El Paso, Texas.

The guest and speaker of the convention was Dr. Ira N. Hollis, president of the American Society of Mechanical Engineers and of the Worcester Polytechnic Institute. His principal address, "The Engineer in the Present War," emphasized that men, not inventions, will win the war, the keynote being struck in his words, "The blood of our children, the youth of America only, will solve this war. After all, it is not an Engineer's war—it's a war of industrial organization."

Dr. Hollis again addressed to the Society at the annual the convention at luncheon at the Ninth Engineers' Camp, Major O'Connor commanding. At this time he lauded the work of the United States destroyers in the war zone, stating they were far superior to anything in the British or German navies. He again spoke dinner that closed the formal session, the keynote of this address being that "America is a country of united people," quoting, "We have something now in the country the world has never seen before,—three thousand miles of people with the same thoughts and the same ideals."

The opening address, "The Engineering School and the War," by President Barnes, emphasized the lack of research and executive type of engineers, and the belief that the war will teach the schools the need of developing their courses to train men along these lines.

The address of Dean G. M. Butler of the University of Arizona upon "Some Effects of the Draft Law on the Arizona Mining Industry" very clearly brought out the problems that the Arizona companies have been facing during this great period of stress.

Nominations of officers for the coming year were made as follows: President, Dean G. M. Butler, University of Arizona; first vice-president, Dean S. H. Worrell, Texas State School of Mines; secretary, C. E. Banglebaugh; treasurer, R. W. Goddard. For Directors to serve three years, Mrs. W. E. Robertson and Gerald Sherman, the following officers holding over as Directors: Messrs. Barnes, Gillis, Gladding and Andros.

At the present time the membership of the Society is 119, and it is interesting to know that practically 20 per cent of the membership is now in war service. This, and industrial conditions in Arizona, brought about a smaller attendance than usual, but the enthusiasm and interest in the meetings made up in a large measure for the shortage.

The Board of Directors voted to hold the spring convention in Arizona, tentatively intending to have a traveling meeting at the principal mining camps.

San Francisco Section, A. I. E. E.

The meeting of the San Francisco Section of A. I. E. E. has been set for November 23rd at seven o'clock p.m. in the assembly room of the Engineers' Club, Mechanics Institute Building, 57 Post street. M. M. O'Shaughnessy, city engineer, will give a paper on the Hetch-Hetchy development, with particular reference to the hydroelectric features. This subject will undoubtedly prove of very great interest to all local engineers, for while the general aspects of the Hetch-

Hetchy plan are fairly well known the real engineering features have not been fully understood or appreciated by many of our members.

Idaho Engineers to Hold Their

Annual Convention

Dr. C. N. Little, dean of the engineering department of the Idaho State University, has been selected to preside at the annual meeting of the Idaho Society of Engineers this year. The engineers will give considerable attention to good roads and other kindred subjects at the time of their annual meeting, which will be held at Lewiston.

Spokane Section A. I. E. E.

The November 16th meeting of the Section is to be devoted to the "Industrial Application of Electricity" and will deal with the uses of electricity as applied to the automobile. The committee in charge are: R. S. Daniels, chairman, L. A. Lewis, J. P. Byron and E. M. Murphy.

The first meeting of the year was that of October 19th when Dr. E. O. Holland, Presi-

dent of the State College of Washington, gave a very fine address on "The Engineer's Responsibility as a Citizen."

Joint Meeting of the Portland Sections of the N. E. L. A. and A. I. E. E.

On November 20, 1917 Preston S. Millar will give an address on "Illumination as Applied to Street Lighting." This is a special meeting arranged in order that the sections may have an opportunity to hear Mr. Millar, when in the city.

Due to the national reputation and wide experience of Mr. Millar this lecture will undoubtedly prove of great interest to electrical men of the coast and a large attendance is expected.

The Oregon Society of Engineers

The second lecture of the course in Thermics was given by Prof. Otto Goldman of the Oregon Agricultural College, at the East Side Library, East 11th and Alder streets, Saturday, Nov. 3rd, at 8 p.m. This series of talks is proving most helpful.

BUILDERS OF THE WEST—XVII

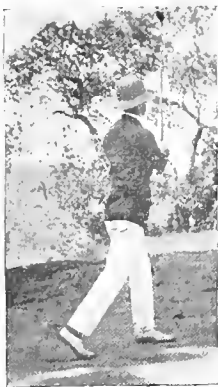


GOVERNOR SIMON BAMBERGER

The building of vast systems of power lines and electrified interurban railroads has been the potent factor in bringing about the triumph of the West in commercial and engineering lines of endeavor. Mountain top and desert alike have felt this helpful, invigorating influence. To Governor Simon Bamberger, builder and statesman in the great commonwealth of Utah, this issue of the Journal of Electricity is dedicated, in appreciation of his contribution to the West in the masterly development of the great intermountain district in which he lives.

PACIFIC COAST ELECTRIC SUPPLY JOBBERS' ASSOCIATION

Quarterly Meeting at Beverly Hills Hotel, October 25-27, 1917



GARNETT YOUNG, of the Telephone Electric Equipment Co., sending out a long one



CHARLIE HILLIS, of the Electric Appliance Co., with only 2 more holes to play. Is he ahead?



K. E. VAN KUREN, of the Westinghouse Electric & Manufacturing Co. Did it go into the rough?



C. B. HAWLEY, of the Intermountain Electric Co. He plays golf, too

When it is all said and done, the real essence of the meetings of the Pacific Coast Electric Supply Jobbers' Association is to be found in the splendid spirit of comradery that is developed at their sessions. This wholesome and revitalizing influence is later reflected in every nook and corner of the great West. The recent meeting at Beverly Hills was unusual for its setting. As a result of its session new life and new

enthusiasm is added for the work ahead. Here is a list of those that attended, surrounded by character-



BILL BERRY, of the Western Electric Company, demonstrates the "form" that won him a place on the famous Jobber's cup after nine years of faithful effort

istic poses of some of the men at this gathering.

At the open session on the closing day L. H. Newbert, head of the commercial department of the Pacific Gas & Electric Company, brought out the idea of absolute open play for all future activities in all branches of the industry as a necessity. This point met with unanimous approval. In the evening, the presentation of cups and the after dinner

speeches following, made the good times at this gathering long to be remembered. Guests follow:

Averill, F. N., Fobes Supply Co., Portland, Ore.
 Alvord, R. M., General Electric Co., San Francisco
 Airey, F. J., Pacific States Electric Co., Los Angeles
 Bacon, Lieut. (and lady), Quartermaster Ft. McArthur, Cal.
 Baker, Capt. (and lady), U. S. R. Ft. McArthur, Cal.
 Boring, Geo., Pacific States Electric Co., Portland, Ore.
 Bibbins, T. E., Pacific States Electric Co., San Francisco
 Bray, J., Western Electric Co., San Francisco
 Berry, W. S. (and wife), Western Electric Co., San Francisco
 Byrne, Harry (and son), Northwest Electric Co., Seattle, Wash.
 Ballard, R. H., Southern California Edison Co., Los Angeles
 Baker, C. G. A. (and wife), Baker-Joslyn Co., San Francisco
 Butts, D. J. (and wife), Western Electric Co., Los Angeles
 Bibber, T. H., Luminous Unit Co., St. Louis, Mo.
 Burger, T. E. (and wife), Baker-Joslyn Co., Los Angeles
 Bach, C. R. (and wife), Manhattan Electric Supply Co., S. F.
 Case, J. O., General Electric Co., Los Angeles
 Clapp, Ralph (and wife), Manufacturer's Agent, Los Angeles
 Chestnut, C. W., Western Electric Co., Seattle, Wash.
 Colkitt, J. M., of John Roebling Sons Co., Los Angeles, and 6 guests
 Davis, C. C., Pacific Hardware & Steel Co., San Francisco
 Deming, W. M., Journal of Electricity, San Francisco
 Davis, L. W., Westinghouse Lamp Co., Los Angeles
 Elliot, A. H. (wife, daughter and guest), Sec'y Jobbers' Ass'n
 Pollard, R. S., Capital Electric Co., Salt Lake City, Utah
 Fenwick, J. F., Hawaiian Electric Co., Ltd., Honolulu
 Graham, N. W. (and wife), Graham-Reynold Elec. Co., Los Angeles
 Gregory, S. B., Arrow Electric Co., San Francisco
 Hawley, C. B. (and wife), Intermountain Elec. Co., Salt Lake City
 Harris, D. E., Pacific States Electric Co., San Francisco
 Heise, Carl, Westinghouse Elec. Manufacturing Co., San Francisco
 Hillis, C. C., Electric Appliance Co., San Francisco
 Hall, C. B., Illinois Electric Co., Los Angeles
 Howe, F. E., Pacific Hardware & Steel Co., San Francisco
 Holabird, R. D., Holabird-Reynolds Elec. Co., San Francisco
 Holabird, H. G. (and wife), Holabird-Reynolds Elec. Co., L. A.
 Hall, W. B., Pass & Seymour, Solvay, N. Y.
 Johnson, C. E., American EverReady Co., San Francisco
 Jones, W. E., Economy Fuse & Mfg. Co., Seattle, Wash.
 Jamison, J. H., Westinghouse Elec. & Mfg. Co., El Paso, Texas
 LaMoree, C. D., Westinghouse Elec. & Mfg. Co., Phoenix, Arizona
 Levensaler, W. M., Dunham, Carrigan & Hayden, San Francisco
 Manchester, J. C., Economy Fuse & Mfg. Co., San Francisco
 Murray, F. H., National Carbon Co., Los Angeles
 Morris, J., Westinghouse Electric & Mfg. Co.
 Murray, J. M., Illinois Electric Co., Los Angeles
 McHugh, R. H. (and wife), Telephone Elec. Equipment Co., S. F.
 Neelando, W. R., Southern Cal. Edison Co., Los Angeles
 Northmore, E. R., Los Angeles Gas & Electric Corp.
 Newbert, L. H., Pacific Gas & Electric Co., San Francisco
 Neyland, A. G. (and wife)
 Pence, D. C., Illinois Electric Co., San Francisco
 Pomeroy, J. G. (and daughter), Mfrs. Agent, Los Angeles
 Quinn, F. J., Manhattan Elec. Supply Co., San Francisco
 Quintard, A. J., Luminous Unit Co., San Francisco
 Oakes, R. F. (and wife), EverReady Co., San Francisco
 Rawls, R. B. (and wife), U. S. Steel Products Co., Los Angeles
 Reynolds, D. L., Del Mar Publicity, Los Angeles
 Sherman, H. E., Jr., H. B. Squires Co., Los Angeles
 Squires, H. B., H. B. Squires Co., San Francisco
 Seaver, W. H., U. S. Steel Products Co., San Francisco
 Sawyer, W. B., Jr., U. S. Steel Corporation
 Steel, M. F., Benjamin Electric Co., San Francisco
 Sibley, Robert, Journal of Electricity, San Francisco
 Scheiber, H. K., Capital Electric Co., Salt Lake City, Utah
 Taylor, S. H. (wife, daughter), Elec. Ry. & Mfg. Supply Co., S. F.
 Van Kuren, K. E., Westinghouse Elec. & Mfg. Co., Los Angeles
 Vandergrift, J. A., National Lamp Co., Oakland, Cal.
 Wiggin, C. E., Dunham, Carrigan & Hayden, San Francisco
 Wurfel, W. C., Westinghouse Elec. & Mfg. Co., San Francisco
 Wood, J. B., Pacific Hardware & Steel Co., San Francisco
 Young, Garnett, Telephone Elec. Equipment Co., San Francisco
 Youngholm (and wife), Elec. Ry. & Mfg. Supply Co., San Francisco
 Zwaifal, H., Electric Appliance Co., San Francisco



TRACY BIBBINS, of the Pacific States Electric Company, setting the pace for his Foursome



F. H. MURRAY, of the National Carbon Co., explains that he is not "kidding"



BILL DEMING, of the Journal of Electricity. The green seems a long ways off



GEORGE A. BORING, of the Pacific States Electric Company. If I only had 'em on my home course!

The San Francisco Electrical Development and Jovian League

The meeting of the Electrical Development and Jovian League with the Downtown Association as guests of the San Francisco Advertising Club, held on Oct. 31, was one of singular importance because of the presence of the delegation from Congress on their way to Hawaii. Bursts of patriotic enthusiasm greeted statements by Representative Treadway of Massachusetts, that we are engaged in our own war for the sake of righteousness, justice and democracy, and by Senator King of Utah, that the American aviator Seegers was right when he said,

"It matters not when you die,
It matters not where you die,
But it does matter how you die,
And what you die for."

The Smoker, held on Nov. 1st at the Elks' Club was a success that fulfilled all the expectations of the large number present. Mr. Merle Smith of the Y. M. C. A. and located at the Presidio, sketched the methods used to relieve the monotony of a soldier's life, and to fill the eight hours during which he is free from discipline. Dependent upon how he uses this eight hours is the morale and efficiency of the army. The jovial Tom Bibber, from St. Louis, impersonated an old soldier and was heartily encored. After a xylophone solo by Ernest Tam, the evening was turned over to the meeting of the "Inductive Interference Commission" which was enlivened by many local hits. The following cast of prominent men took part in the "hearing":

INDUCTIVE INTERFERENCE HEARING

Thursday Evening, November 1st, 1917, Elks Building.

Cast

Watts (Janitor).....A. V. Thompson
Jots (Stenographer)J. S. Thompson
Scoops (Reporter).....Robert Sibley
Shorty Circuit (Attache).....R. E. Fisher
D. I. Nough (Railroad Commissioner).....Nick Pendergast
Horse Power Pussy (Atty. for Great Wind Power Co.)...H. P. Pitts
Irate Francisco (Atty. for Specific Jass Co.).....Ira Francis
O. U. Rialto (Engr. for Phoney Company).....L. S. Ready
Al. Babcock (Engr. for Rail Roadng Co.).....Miles Steel

Witnesses

Witness for Contractors.....C. F. Butte
Witness for Press.....Art. Halloran
Witness for Jobbers.....Al. Minema
Witness for Manufacturers' Agents.....Tracy Simpson
Voice from the Mob.....K. I. Dazey

At the meeting of Nov. 7th a memorable symposium took place. H. C. Reid, president of the California Association of Electrical Contractors and Dealers, introduced the speakers of the day, who spoke of the relations between the civic officers, the dealers, and the public. Arthur Kempston, chief of the Department of Electricity, San Francisco, called attention to the fact that most trouble is caused by misunderstandings and urged more frequent meetings. The Industrial Accident Commission was represented by Jno. R. Brownell, superintendent of the commission, who praised the support given by the various cities and by the electrical fraternity. Robert Eltringham, electrical engineer for the commission, explained the proposed state law for inspections and asked for any and all suggestions from the electrical industry. Carl Hardy, City Electrician of Oakland, illustrated the very important part in the molding of public opinion played by the small contractor, whose every action is reflected in the public attitude.

President Robert Sibley has appointed the following committees:

Finance and Public Policy: W. M. Deming, ch., H. F. Jackson, Carl Heise, T. E. Bibbins, W. S. Berry, H. C. Reid, W. F. Neiman, E. O. Shreve, W. W. Briggs, John A. Britton.

Reception: R. E. Fisher, ch., D. E. Harris, Tracy Simpson, F. E. Boyd, E. B. Strong, W. R. Dunbar.

Attendance: H. P. Pitts, ch., M. S. Orrick, C. E. Wiggin, W. C. Wurfel, A. Youngholm.

Entertainment: Frank Rieber, ch., D. K. Lippincott, J. E. Warner, R. F. Behan, R. E. Fisher, H. P. Pitts, A. V. Thompson, Joe Thompson.

Editor Live Wire: A. H. Halloran.

In Charge Local Publicity: Nathan A. Bowers.

Membership: Rod G. Guyett, ch., J. C. Manchester, L. H. Newbert, R. M. Alvord, Garnett Young, W. S. Coleman, C. F. Butte, A. E. Drendell, H. C. Reid, J. M. Barry, Miles Steel.

Illuminating Engineering Society, Chicago Section

A schedule of monthly meetings from November to June of 1918 has been prepared by the Chicago Section of the Illuminating Engineering Society which is to include talks by leading engineers, men of the trade and college professors. Prof. F. C. Caldwell of Ohio State University is to speak on "Preferred Proportions in Combining General and Localized Lighting" on the meeting of Thursday, Nov. 15th.

INFORMATION TO APPLICANTS FOR ENLISTED ORDNANCE CORPS

What It Is.—The Enlisted Ordnance Corps, National Army, into which the Ordnance Enlisted Reserve Corps has been merged, is charged with the supply, maintenance and repair of all cannon and artillery vehicles and equipment; all machines for the service and maneuver of artillery; all small arms, ammunition, harness, motor trucks, motorcycles, tractors and railroad cars; in fact, it is the Army behind the Army commonly known as "Service of the Rear."

Type of Men Wanted.—There is a place for practically every man who knows a trade in the Enlisted Ordnance Corps. Machinists, mechanics, plumbers, painters, carpenters, canvas workers, auto mechanics, saddlers, blacksmiths and wheelwrights are especially needed at this time.

Applicants must be between 18 and 40 years, citizens of declarants, and be able to speak, read and write the English language, should have no absolute dependents, and must be able to pass a physical examination conforming to that prescribed for the Regular Army.

Place and Type of Service.—If accepted for enlistment, men will ordinarily be sent to an arsenal school for a period of instruction, on completion of which they will be assigned to detachments, units or organizations, with ultimate service abroad. Previous military training, while preferable, is not essential, as men will continue the work which they pursue in civil life.

Pay and Grade.—In view of the importance of their work a large number of men will serve as non-commissioned officers. Original enlistment is required as private, but later courses of training or special qualifications quickly lead to higher grades. Pay ranges from \$30 to \$97.20 a month, depending upon demonstrated ability and place of service. Men enlist for duration of war only.

Free quarters, rations, clothing, bedding, medical attendance, etc. are provided.

Relation to the Draft.—Men registered under the Selective Service Law may voluntarily enlist prior to the posting of their names by their Local Boards. No man who has been called to appear for physical examination is eligible for enlistment in any branch of the military service. In case such men do enlist the department under which they have enlisted will be requested to discharge them and direct them to report to their local boards.

How to Enlist.—Get application blank by writing to Chief of Ordnance, Enlisted Personnel Division, Washington, D. C. Fill it out, return to Chief of Ordnance, and if there is an opening for you at the time, authorization will be sent you to enlist at the nearest recruiting station, and if accepted there, free transportation will be provided to place of service

HAPPENINGS IN THE INDUSTRY

New Power Loads

The Enterprise Foundry Company, at South San Francisco, has ordered two additional electrically operated steel furnaces, each of 350-kw. capacity, single-phase.

Camp Fremont is to be lighted by electric current. Each tent is to have a light, and all buildings and avenues are to be lighted. There will be about 25,000 or 30,000 lights.

During the past month the consumption of energy by the Municipal Railway system of San Francisco was 2,701,401 k.w.h., or an increase of over 100 per cent for the corresponding month of last year.

The work of laying the submarine cables across Islais Creek, at Third street, has been completed and the channel is now open to navigation. The massive steel Bastille drawbridge at the creek is operated by 440-volt power.

The Spring Valley Water Company has installed a 250-h.p. pumping plant at Bayview Road, near Menlo Park, for the supply of water to Camp Fremont.

Messrs. J. W. Plant, L. Gardella and T. M. Lane, owners of the Plymouth Rock mine, near Jenny Lind, Calaveras county, have announced their intention of erecting a large stamp mill on the property, which will require an additional installation of 150 horsepower, making a total installation of 200 horsepower.

Rapid progress is being made on the buildings at the big Electric Smelting Company's plant at Bay Point, California, and fires were started under two furnaces October 15th. Every part of the 20-acre tract is now having something built on it, or planned for it, and a model city is also being planned for the employees. Scores of cottages will be constructed. More than 15,000 horsepower will be needed to run the plant, and electric lines are being put in by three companies to supply power. The Bay Point plant will produce ferrosilicon and other alloys used in the steel industry.

Changes and Beginnings

Allen S. Halls is now the head of the National Electric Company, and has established his offices at 517 Railway Exchange Building, Portland.

Gilson Electrical Supply Co. has moved from 413 Fifth street, Oakland, California, to 304 Twelfth street. L. C. Gilson is general manager and A. H. Nylen purchasing agent of this concern.

The Electric Supply Company of Salt Lake City, Utah, have moved to 243-245 South State street, where wholesale and retail lighting fixture displays are housed in five separate rooms. The larger stock also includes auto accessories and a complete line of wholesale and retail supplies.

Carter Electric Co., Ltd., has recently opened up a store at 650 Granville street, Vancouver, B. C., which will handle the same line of work as this company's Victoria store, namely, wiring contracting, fixture and electric supplies. This company desires to secure catalogues from electrical manufacturers and jobbers. Harry D. Rees is secretary and treasurer.

Manager Mann of the Western Union Telegraph Company's plant in Fresno announces that the company has leased one of the stores in the new Mason block that is now being rushed to completion. The office will be located on the ground floor, while the plant department, or the receiving and sending end, will have quarters on the sixth floor of the building. The equipment has already been ordered.

Kellar-Thomason-Fleming Company, of Fresno, filed articles of incorporation as dealers in irrigation supplies, manufacturers and general dealers. Its capital stock is \$10,000 with a board of three directors handling the business for the first year. On the board are George C. Martin, Rolla Coffeen and R. C. Fleming, all of Los Angeles. The principal place of business is to be Fresno. Henry Hawson is attorney for the company.

Deschner Electric Co., Inc., 906 Main street, Miles City, Mont., is the new name for Deschner's Electric Co., the business having been incorporated as of July 1st with a capitalization of \$25,000, and a charter covering all branches of the electrical contracting, repairing and supply business. The officers of the company are A. J. Deschner, president; H. F. Deschner, secretary and treasurer, and Geo. K. Foster, A. H. Mork and Henry G. Ferncase, trustees.

Majestic Electric Development Co., 656-658 Howard street, San Francisco, early during the present year absorbed the Shoenberg Electric Co. of San Francisco, and is now marketing all the products formerly made by this company, in addition to the Majestic electric heaters, dental and surgical appliances heretofore produced by the Majestic Electric Development Co. The latter organization now operates branches at Philadelphia, Kansas City and Toronto, Canada. The branch at Toronto, Canada, is operated as a separate corporation, however, under the name of Majestic Electric Co., Ltd.

United Trading Co., 595 Mission street, San Francisco, has recently added to the list of Eastern factories which are now represented, the National Stamping & Electrical Works of Chicago, makers of electric water and coffee urns. The United Trading Company was organized last year by Max Loewenthal, E. Greenebaum and J. Thieben, owners of the Panama Electric Lamp Company. This company represents the following manufacturers: Menominee Electric Mfg. Co., Pittsburgh Electric Specialties Co., Swedish-American Telephone Manufacturing Co., Pioneer Corporation, Premier Electric Co., Ruvio Electric Co., on the Pacific Coast.

American Chemical & Ozokerite Co., formerly known as the Wasatch Ozokerite Co., miners of ozokerite at Soldier Summit, Utah, is building a chemical plant at Grand Crossing, Chicago, Ill., where ozokerite will be treated and manufactured. Ozokerite is a rare substance formerly imported from Austria before the war. It is plastic without being soft and hard without being brittle. It is used for insulation purposes and in the manufacture of insulators, telephone transmitters and receivers, for wax used to insulate electric cables and for various other purposes. The Utah deposit is the only known commercial deposit of ozokerite in the United States.

New Business

The Pacific Telephone & Telegraph Company of San Francisco has installed 500 new phones in the last 90 days.

During the month of September the Stockton division of the Western States Gas & Electric Company secured 214 new electric customers, among which were 17 power customers with a combined load of 215 horsepower in motors. During the same period 163 new gas customers were secured.

M. C. Baker & Son, The Electric Shop, San Francisco, have recently secured the contract for ventilating the Hippodrome Theatre with one of the new type noiseless air-cooled Ilg electric motors. They have also constructed and built for the Hippodrome Theatre 4 toy balloon inflating machines which they are having made for their different theatres throughout the Pacific Coast.

Northern Electric.

In order to render possible the settlement of the troubles of the Northern Electric System petitions in involuntary bankruptcy have been filed again by Messrs. Leon and Louis Schloss, Mr. W. P. Hammon, E. J. de Sabla, Jr., E. R. Lillien-
nal as endorsers of the outstanding notices of the railroad company. It does not follow that the parties at interest will be declared bankrupt by reason of the proceedings. The action is to be taken merely as a means to an end.

Seattle Wins Earnings Case

Judge J. T. Ronald of the King County Superior Court at Seattle, Wash., recently sustained the city's demurrer to an amended answer in the action brought by the city of Seattle to recover \$64,000, representing 2 per cent of the gross earnings of the Puget Sound Traction, Light & Power Company of Seattle during 1916. The company pleaded that it had petitioned the State Public Service Commission to be relieved of this 2 per cent gross earning tax and other franchise obligations, and claimed that the city was responsible for a loss of \$70,000 or thereabouts through the passage of an ordinance requiring the sale of tickets on cars, later held invalid by the federal court. On Jan. 15, last, the company offered a check to the city for \$64,000, representing 2 per cent of its gross earnings for 1916, with the provision that in accepting it the city abandon its plan of bringing suit to require the company to pave rights-of-way, assume portion of the cost of bridges and other obligations, which the company is seeking to have abrogated by the State Public Service Commission. The city of Seattle refused the check and directed Mr. Caldwell to bring suit to recover the amount.

Western States Gas & Electric Earnings

Earnings of Western States Gas & Electric Company, a Standard Gas & Electric Co. subsidiary, are reported as follows for September and year ended Sept. 30, compared with corresponding previous periods:

Month of Sept.	1917	1916	Increase	Per cent increase
Gross earnings.....	\$118,052	\$102,899	\$15,153	14.7
Net earnings	54,363	49,926	4,436	8.8
Year ended Sept. 30				
Gross earnings.....	\$1,355,484	\$1,224,932	\$130,551	10.6
Net earnings	635,148	584,929	50,219	8.6

San Joaquin Light and Power Earnings

The San Joaquin Light and Power Corporation has reported to the National City Company on earnings for the twelve months ended September 30. Gross and net income for the month and for the nine months' period show gains over 1916, but the increased cost of operation since the first of the present year is reflected in the earnings for the twelve months' period. Gross earnings for the twelve months showed a gain of \$161,030 over the previous period.

Twelve months ended September 30—			
	1916	1917	Increase
Gross earnings	\$1,843,668.58	\$2,004,698.66	\$161,030.08
Operating expenses, maintenance and taxes.....	708,469.13	851,750.60	143,281.47
Net income	\$1,135,199.45	\$1,152,948.06	\$17,748.61
Interest charges	479,645.51	521,666.55	42,021.04
Balance	\$ 655,553.94	\$ 631,281.51	\$24,272.43
*Decrease.			

Earnings of Utah Securities' Properties

The Utah Securities Corporation reports gross and net earnings from operation of all properties now controlled by the corporation, inter-company charges eliminated, for the twelve months ended August 31, 1917, as compared with the earnings for the same periods the previous year, were as follows:

	1917	1916	Increase	
			Amount	Pct.
Gross earnings	6,237,064	5,306,547	930,517	18
Net earnings	3,393,952	2,909,888	484,064	17

Western Power Corporation

Gross and net earnings of the five companies comprising the Western Power system, for August, compare as follows:

	1917.	1916.
August gross	\$331,825	\$306,596
Net after taxes.....	209,828	191,515

Search for Coal in Eastern Idaho

In response to numerous requests of residents of Idaho an examination of certain reported coal fields in the eastern part of the state was made last summer by a geologist of the United States Geological Survey, Department of the Interior, in order that any coal land present in this part of the state might be classified and thus made available for local mining, so as to relieve the high prices and threatened scarcity of fuel. This work has just been completed, and the results are not at all encouraging so far as the development of a local supply is concerned.

The only productive part of the Teton Basin is the Horseshoe district. Though conditions in this district are such that large-scale development is impracticable, work now in progress will probably make possible a somewhat greater yield than that of last season.

Raise in Key Route Wage Schedule

The board of arbitration selected to adjust the wage controversy between the carmen and the San Francisco-Oakland Terminal Railways reached a unanimous decision recently, awarding the men a substantial increase in compensation. The new wage scale is approximately 12 per cent above the existing rate and will affect 1100 motormen, conductors and brakemen of the Oakland Traction Company and Key Route. The average rate of pay of the men at the present time is approximately \$3.50 for a ten-hour day. The decision raises this to approximately \$4 a day.

The award was signed by all members of the board—Paul A. Sinsheimer, chairman; John Drum and George Kaufman. Drum was chosen by the company, Kaufman by the men and Sinsheimer was selected as the third arbitrator.

Spillway and Hydroelectric Station

Erection of penstocks for the addition to the Panama hydroelectric station continued, and preliminary work was done for the erection of the headgates. Eighty tons of steel were erected in the building proper, practically completing this part of the work. Concrete placed during August amounted to 522 cubic yards.

The net output of the hydroelectric station during August was 4,730,300 kilowatt-hours. The ratio between water used for power and for Gatun Lake lockages was 2.39 to 1. Water wasted over the spillway amounted to 17,710.54 million cubic feet. Rainfall over the lake surface, 13.97 inches, was the highest recorded for August. It was 32 per cent above the 7-year mean.

Limit of Service Required from Public Utility

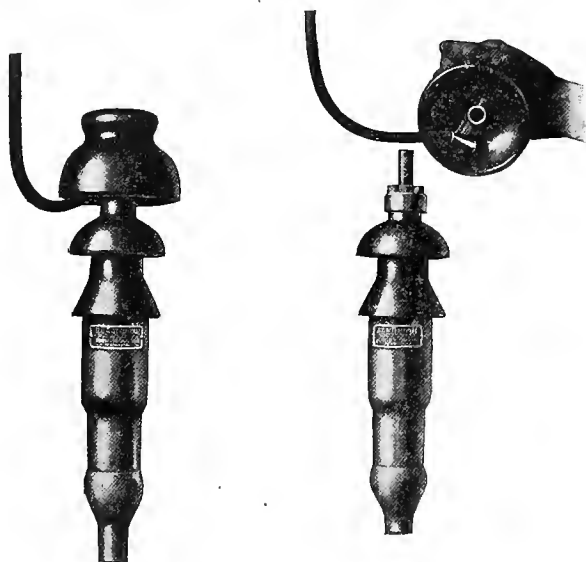
Although a person may live within the corporate limits of a city, that does not justify him in demanding service from a public service corporation if the income in sight would require ten years to reimburse the company for the expense of installation without anything for upkeep, service or depreciation, rules the public service commission in the case of George F. Yantis against the Olympia Light & Power Company. Yantis lives within the corporate limits of Olympia. He wanted light service, but the company refused to install it owing to the cost. The company did agree to put it in if he would buy two shares of capital stock to provide the money. This he declined to do and appealed to the commission. The commission holds it would be unreasonable to force the company to spend the money to serve him.

LATEST IN EVERYTHING ELECTRICAL

(The plans of the Society for Electrical Development for a Christmas campaign in place of Electrical week are today occupying the center of interest in things electrical. A new type of brake, an outdoor cable terminal and other recent devices are here included.—The Editor.)

AN OUTDOOR CABLE TERMINAL

A new style of outdoor (Type D.O.A.) cable terminal has recently been placed on the market by the Standard Underground Cable Co., Pittsburgh, Pa. It is known as the Protected Disconnection style. All the copper parts are covered by a porcelain hood, as shown in the illustration, which permits the disconnection of the aerial extension wire even while the circuit is alive.



Outdoor Cable Terminal

All the outdoor (Type D.O.A.) cable terminals made by the Standard Company are readily disconnected from the aerial conductor either by means of a set-screw, a cap-nut or turnbuckle stem. The stem of the new terminal is a modification of the regular cap-nut stem and has some additional advantages where frequent disconnection of the aerial circuit from the terminal is necessary. The new terminal, as well as the complete line of Standard outdoor cable terminals, is fully described in Bulletin No. 700-2, which has just been published and is now ready for distribution.

NEW TYPES OF BRAKES

Types RS and M are the terms designating an alternating current, motor-operated brake and a direct current magnet-current brake, which have recently been gotten out by the Cutler-Hammer Company. The alternating current brake with motor operation has been generally found to be more suitable than one depending on solenoid or magnet

operation because of the inherent characteristics of A.C. solenoids being unsuitable for braking service. The motor-operated brake is silent in releasing, in applying and while held released. A high torque squirrel cage motor is employed geared to

a toothed sector which is linked to the arms carrying the brake shoes. When power is applied, the motor revolves until the brake is released. It then stalls and maintains the brake in the released position until power is cut off. One of the outstanding features to be noted is the ease of making adjustments of brake for wear by means of simply turning a nut on the end of the thrust rod which is the upper rod shown in the accompanying illustration. This adjustment is required only two or three times during the life of the brake lining. These brakes are made in sizes ranging from 8 to 30 inches with ratings up to 250 h.p.

The direct current magnet or solenoid brake is similarly constructed but has a magnet in place of a motor, the D.C. magnet being eminently suited for brake operation. Six standard sizes ranging from 8 to 27 inches with horsepower ratings like the motor-operated type RS brake mentioned above. Brakes of this construction are particularly suited for severe service.

AN ELECTRICAL CHRISTMAS

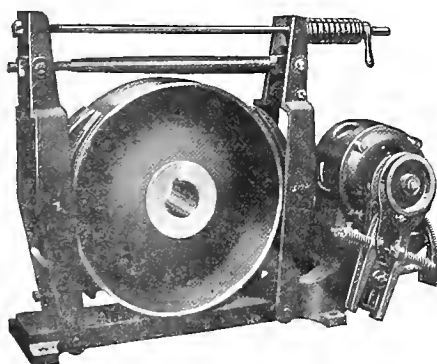
This year instead of Electrical Week, the electrical industry is launching a campaign for an Electrical Christmas. Under the auspices of the Society for Electrical Development, members and non members may avail themselves of the posters and other sales helps. The society's November Sales Service includes concrete ideas on how to plan and carry out local campaigns to make them successful. Colored lithographs, window and price cards, poster stamps, illustrated newspaper cuts, window displays, sales-letters, and lantern slides are being furnished without cost. Also two new one-act Christmas movie films have been gotten out with the emphatic suggestion "Give Something Electrical This Christmas!"



NEW BATTERY FOR ELECTRIC POCKET LAMPS

A new dry battery for electric pocket lamps has been invented by a citizen of Zurich. It is said to be cheaper, better, and of simpler construction than those now in use. Instead of a single block battery it consists of three separate and distinct elements, which are placed side by side in the metal lamp case. The chief improvement is the possibility of substitution for a single element in case the battery is out of order.

In the event of the battery becoming defective, the voltage of each element is tested to ascertain which one is useless, and it may then be replaced by a single new element. Naturally the cost is considerably reduced. Another important improvement is the possibility of using the new battery in connection with almost any pocket-lamp case now in use.



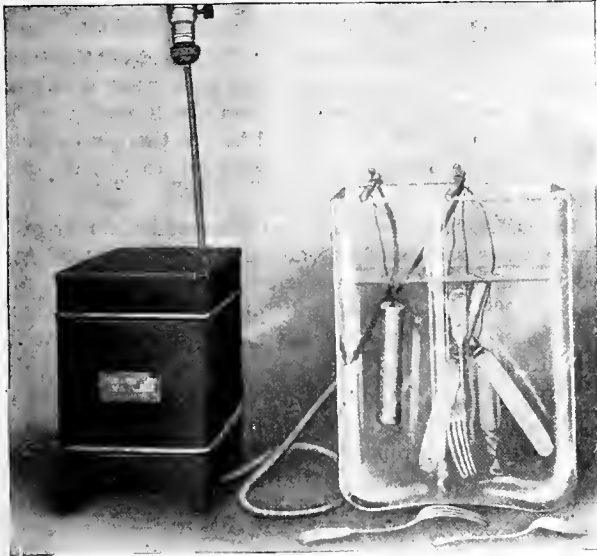
Motor-operated Brake

A factory installation consists of an eccentric press, a drying oven, a brush-cleaning machine, a galvanic copper bath, and a filling machine, the total cost of which in Switzerland is estimated at \$2,500. Such a factory is said to be capable of producing daily 30,000 elements, or 10,000 batteries.

The cost of materials per element to the manufacturer is 0.4156 cent or 1.247 cents per battery in normal times, and 1.0436 cents per element or 3.131 cents per battery today. All the raw materials without exception are said to be available in the United States, and it is even assumed that they are less expensive there than elsewhere.

THE NEW TUNGAR RECTIFIER

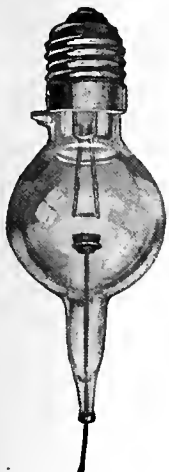
A new type of alternating current rectifier has been recently perfected at the research laboratories of the General



Tungar Plating Device

Electric Company and standardized in several convenient commercial types.

While alternating current is all right for light and power, in a great number of instances, such as storage battery charging, electroplating, etc., only direct current can be used. And, in most cases, only alternating current is available in cities and villages where there is electric service. So the demand for rectifiers, especially in the smaller sizes, is very large.



Tungar Bulb

The new "Tungar" rectifier is a hot cathode, argon gas-filled device. The principle is entirely new, although it has long been known that a vacuum tube containing a hot and a cold electrode acts as a rectifier. The device consists of a small glass bulb, similar to an incandescent lamp, in which the rectification takes place; a little compensator, or transformer, which reduces the alternating current without wasteful resistance; a fuse and an enclosing case. The Tungar rectifier bulb, filled with an inert gas, at low pressure, contains a low voltage tungsten filament and a graphite "anode." These glass bulbs are inexpensive and will last for hundreds of hours of service.

These rectifiers may be used for charging all small storage batteries, such as used for miners' lamps, inspectors' lamps, dentist lamps, exit lights, electric piano players, burglar alarms, railroad signals, lighting systems of bicycles, motorcycles, motor boats and carriages; ignition systems on automobiles, stationary gas engines and tractors; fire alarms, call bells and buzzers, telephones, etc.

BOOKS AND BULLETINS

Miscellaneous

Transmission Line Coordinate Paper is advertised in a recent Bulletin issued by Raymond S. Brown of Columbus, Indiana. It is designed to afford transmission engineers an exact method for finding the electrical conditions at any point of an alternating current transmission line when the conditions at some particular point are known.

"The Manufacture of Gas," a bulletin from the Census bureau covering the statistics for this industry in 1914 has recently been issued.

A Census Bulletin, listing and tabulating the manufacture of electrical machinery, apparatus and supplies in 1914 has been given to the public and may be obtained by application to the Bureau of the Census.

The Agricultural Department of the University of California has recently issued a 14 page booklet on the "Control of the California Ground Squirrel" in which it is pointed out how this rodent which seriously affects irrigation and consequently related electric problems, can be effectively destroyed. Joseph Dixon is author of the paper which can be sent for under the title 'Circular No. 181.'

The United States Bureau of Standards has issued an outline of work which has been done in a study of the standards of good practice and good service as applied to public utilities. The branches of the main subject include standards for electric service, standards for gas service, standard methods for gas testing, National electrical safety code, electrolysis mitigation and other activities.

Joseph K. Choate's address before the American Electric Railway Association on "Increased Income for the Electric Railways" has recently been put into pamphlet form.

War Conditions in the Industry

"Why the War Must Go On" is the title of a booklet recently published by Hodder & Stoughton, Publishers of London, giving the English point of view.

"Organizing a Democracy for War" is the title of Bulletin No. 25 issued by the United States Chamber of Commerce.

According to Bulletin No. 6, gotten out by the Trade and Technical Section of the Public Information Bureau, retail merchants of the United States are volunteering window displays to aid in the food-saving campaign. Prizes have been offered for the best windows in different sections of the retail trade. The contest is being conducted by the United Publishing Corporation, of New York, in co-operation with the United States Food Administration, and covers dry goods, hardware, house furnishings, and other trades.

"British Railways and the War," by F. A. McKenzie, published by the Menpes Printing and Engraving Company of London, contains a study of English railway war and after-the-war problems.

BOOK REVIEWS

Hopwood's Living Pictures

by R. B. Foster; size 6 x 9 in.; 370 pages; published by the Hatton Press, London, England and for sale by the Technical Book Shop, San Francisco. Price \$2.50.

The development of the moving picture from the early days of the kinoscope to the modern up-to-date machines is a history of such fascination that this book must appeal to the general public as well as to the specialist on the subject for whom it was designed. It is a revision, or rather, re-writing of Henry V. Hopwood's earlier book on the subject, comprising the historic evolution of the cinematograph much as in the earlier work, and in addition, throughout the major portion of the book in fact, dealing with such subjects as Present Day Apparatus, Pictures in Colors, Speaking Pictures, Legal Matters, Manipulation and Practice, the Question of Copyrighting and like matters. The book is addressed to the manufacturers of moving picture materials and to others actually engaged in the industry, but it is not too technical for the ordinary reader.

NEW ELECTRICAL DEVELOPMENTS

(A proposed power plant which is to supply electricity to a railway in Montana, increasing demands for electricity for farm purposes in the great California valleys, and a growing tendency toward municipal ownership of power and light plants in the Southwest mark the activities of the last two weeks in things electrical.—The Editor.)

THE PACIFIC NORTHWEST

PORTLAND, ORE.—Sherman County Light & Power Company has incorporated.

SPOKANE, WASH.—The Reilly-Harness Telephone Company has been incorporated here.

MARSHFIELD, ORE.—The Sitka Spruce Company has contracted for a full electric lighting and power system.

OROVILLE, WASH.—An ordinance granting a fifteen-year franchise to the Okanogan Valley Power Company has been passed by the council.

SEATTLE, WASH.—Pacific Machine Shop & Manufacturing Company, Seattle, has the contract for installing electrical winches on 14 wooden ships.

McMINNVILLE, ORE.—Efficiency aid service will be the slogan of the municipal electric plant at McMinnville as the result of repairing the entire plant on Baker Creek and the installation of new machinery.

LACONNER, WASH.—LaConner and vicinity have raised \$21,000 for construction of a power line from Mount Vernon. The line will be constructed by the Puget Sound Traction, Light & Power Company.

SEATTLE, WASH.—The War Department has awarded a contract to the Aero Alarm Company of Seattle for the installation of aero automatic fire-alarm systems in 330 buildings in 16 National Army contingents.

VANCOUVER, B. C., CANADA.—It is reported that the Grandy Consolidated Mining, Smelting & Power Company, Ltd., is to spend more than \$1,000,000 in the purchase of coal lands in the Nanaimo district of British Columbia.

WASHOUGAL, WASH.—The Northwestern Electric Company has applied to the County Commissioners for an extension of its franchise privilege to supply electricity in the eastern part of the county near Camas and Washougal.

SHELTON, WASH.—The Puget Sound Pulp and Power Company, which proposes the construction of a large paper mill near Port Angeles, has applied to the Mason County commissioners at Shelton for a 50-year franchise for a power line.

WILBUR, WASH.—The council will receive bids up to Nov. 21st at 7:30 p.m. for a double head type siren, equipped with electric motor for A.C. current, 60 cycle 115 volts. Certified check for five per cent of bid, payable to town clerk, required.

BEND, ORE.—A 600 horsepower generator has arrived in Bend and will be installed in the third unit of the Bend Water, Light & Power Company's plant now nearing completion. An estimated expenditure of \$35,000 is involved in the new equipment.

SEATTLE, WASH.—The General Electric Company was low bidder for the motor generator desired by the city at \$7893 and the Standard Underground Cable Company was awarded contract for 1500 feet of mill cable for the lighting department at \$1789.

VANCOUVER, WASH.—NePage McKenny Company, electrical engineers and contractors with offices in Seattle and other coast cities, have the contract for complete electrical equipment in the school for the blind being erected by the state at Vancouver.

BAKER, ORE.—J. W. Riggins, who is one of the largest wheat ranchers in the valley, is advertising for bids for the

construction of four miles of irrigation ditches which will comprise a part of the elaborate irrigation system he is to install, including a modern pumping plant.

GOLDENDALE, WASH.—The Board of County Commissioners of Klickitat County has granted to the Pacific Power & Light Company a 50-year franchise to erect poles and wires for the transmission of electricity for all purposes along the county roads and streets in White Salmon and its vicinity.

EVERETT, WASH.—Burns & McDonald of Kansas City will be instructed by the city council to compile data regarding the cost and work to be done on the Sultan river for a power plant, so that it may be laid before the commissioners, who are contemplating a special election to put the matter before the people.

TACOMA, WASH.—H. F. Gronen, commissioner of light and water, has requested the city attorney to frame an ordinance for introduction in the city council, providing for an issue of \$4,000,000 worth of utility bonds for the purchase of a power site. It is reported that the ordinance will be introduced without delay.

NORTH YAKIMA, WASH.—Owners of 2000 acres lying above the Sunnyside Canal north of Prosser at a recent election approved the proposal of the Government to install a pumping plant there and put the land under irrigation. The estimated cost is \$220,000 and an appropriation of \$250,000 is available for the work.

VICTORIA, B. C.—The Kootenai Power Company has announced that it will spend \$2,500,000 in building a high tension power line from the end of its Boundary system in the vicinity of Greenwood and west as far as Copper Mountain. The power company will also extend a power line to Penticton for industrial purposes.

EVERETT, WASH.—A 30-month priority right on the waterpower of the Sauk-Suiattle river in Washington has been granted to the American Nitrogen Products Company, Securities Building, Seattle. It is proposed to erect the first unit of the nitrate plant at Darrington. Three units are contemplated at an estimated cost of \$6,500,000.

PRINEVILLE, ORE.—Extensive improvements on the Ococho and Canyon Creek road from site of the proposed dam of the Ococho Irrigation district to the Wheeler county line have been authorized by the county commissioners. Improvements involve expenditure of about \$40,000 and will be made under the supervision of the state highway commission.

SEATTLE, WASH.—The Nitrogen Products Company, Securities Building, which has a large plant in operation at La Grande, now has three crews of 12 men each making surveys for a railroad to bring materials to the site of its proposed \$3,000,000 dam it is to construct at the falls on the north fork of the Sauk river, 14 miles from Badal's. Extensive borings are now being made for foundations for the huge structure.

HELIX, ORE.—An improvement requisition has been authorized by the Pacific Gas & Electric Company for the construction of a 6600-volt three-phase line to Helix. The present equipment at Adams besides being single-phase is insufficient to take care of the additional load and therefore will be removed from service. An outdoor substation will be built at Adams using two 100-kw. 23,000-2300-volt and three 50-kw. 2200-6600-volt transformers from Flavel with the necessary current controlling and switching equipment.

SEATTLE, WASH.—Bids have been called for by the state board of control, O. A. Torgerson, secretary, Olympia, Wash., to be opened December first, for the construction of a power plant at the state school for girls at Grand Mound, Wash., estimated to cost about \$40,000. Figures will be received for the general contract, heating and central power plant, plumbing contract, wiring and installation of generator set. Plans may be obtained from Heath & Gove, Tacoma; Julius Zittel, Spokane and G. W. Lawton, Alaska Building, Seattle.

SEATTLE, WASH.—The city council has passed an ordinance providing for the issuance of \$40,000 utility bonds for the extension of Division A to Market street and Leary avenue. An ordinance was also introduced transferring \$35,000 from the general fund to the municipal railway construction fund 1917 in addition to the \$20,000 already transferred from the general fund. This indicates that it is not the intention of the council at present to rely on the sale of bonds to extend the road. The council committee of the whole recommended the passage of the ordinance transferring the \$35,000 and the council accepted the report, voting the action be deferred until the next meeting.

THE PACIFIC CENTRAL DISTRICT

EUREKA, CAL.—The city will soon call for bids for city lighting.

GILROY, CAL.—The town of Morgan Hill is considering installing an electric plant of its own.

AUBURN, CAL.—Lora J. Moore of Tahoe City has secured a water right of water of Slim Jim Creek, tributary to Lake Tahoe, for supplying electrical power.

NAPA, CAL.—Merchants and taxpayers have sent to the State Railroad Commission a protest against the granting of a 100 per cent raise in gas rates to the Pacific Gas and Electric Company.

EUREKA, CAL.—The Eureka division of the Western States Gas & Electric Company has completed laying its 11,000-volt cable across Humboldt Bay to supply electricity to shipyards and other industries in that district.

HANFORD, CAL.—Within a short time the People's Ditch Company will install, at the headgate of the irrigation system, an electric light and power plant. A string of lights will be placed across the river above the dam.

SAN FRANCISCO, CAL.—The Western States Gas & Electric Company board of directors has declared the regular quarterly dividend of 1½ per cent on the preferred stock of the company, payable Oct. 15 to stockholders of record Sept. 29th.

MERCED, CAL.—The proposition of municipal management of the city's light system promises to develop into a definite issue. The city trustees, after some investigation into the matter, plan to bring up the question at their next regular meeting.

SAN FRANCISCO, CAL.—The Gas and Electric Sales Company has been incorporated here with a capital stock of \$40,000. The subscribers and directors: Thomas Steel, Berkeley, Cal.; M. J. Purcell, V. A. Kuehn, Lee M. Olds, A. C. Duerr, of San Francisco, one share each.

FRESNO, CAL.—Representing an expenditure of \$60,000, the San Joaquin Light and Power Corporation has purchased the Merced Stone Company's plant and power lines at Kittridge, Mariposa county, and will extend the power lines to several mining claims, as well as Coulterville.

AUBURN, CAL.—The Pacific Gas and Electric Company announces that the two ends of the long tunnel through the hill near Newcastle met, after several months' work. It will take about a month to complete the bore, and in that time the canal and other work will also be completed.

OAKLAND, CAL.—The Peninsular Railway has asked the Railroad Commission for permission to build a track at

grade from its track on University Avenue extension, near Palo Alto, across the westerly side of University Avenue extension and across a spur track of the Southern Pacific Company.

NAPA, CAL.—The Board of Supervisors awarded the contract to install electric lights in the new Hall of Records to Meyberg Company of San Francisco on their bid of \$646. The other bidders were Earl G. Wilson, \$768, J. W. Butcheal, \$936. Fixtures are to be installed under supervision of Earl Wilson.

FORT BRAGG, CAL.—Exhaust steam from the power plant of the Union Lumber Company, which represents a large amount of energy lost, will soon be utilized to run a pressure turbine generator capable of producing 750 kilowatts of electricity. This will put them in better position to furnish lights to Fort Bragg.

SAN FRANCISCO, CAL.—The next quarterly dividend on the common stock of the Pacific Lighting Corporation, which is payable November 15 to stock of record November 1, will be at the rate of \$3 per share, or 12 per cent per annum. Heretofore the company has paid \$2.50 quarterly, or 10 per cent per annum.

CHICO, CAL.—The intersection system of lighting has been decided upon by the board of trustees. The trustees will call for bids on the new system. It is understood that the Pacific Gas and Electric Company will not bid and that the rate of \$319 a month quoted by the Northern California Power Company will be accepted.

MERCED, CAL.—A growing demand for electricity for farm purposes around Merced necessitates a big increase in the capacity of the local substation of the San Joaquin Light and Power Corporation. Local agent Raleigh Casad says that plans are now under way for the extension of the capacity from 1200 kilowatts to twice that measure.

SAN FRANCISCO, CAL.—The lighting of San Francisco's "Triangle District" is to be completed by December 15. The initial cost of installation will be at least \$85,000. Electric current alone will cost \$30,000 a year. The money needed has been raised by private subscription on the part of merchants and property owners in the district that is to be lighted.

SAN FRANCISCO, CAL.—The Roberts Manufacturing Company submitted the lowest bid to the Board of Public Works for furnishing and installing lighting fixtures in the northeast wing of the San Francisco hospital at \$6216. Bids were also opened by the board for the electric work in connection with the yard work at the hospital and a contract will be awarded within the next few days.

REDDING, CAL.—The Pacific Gas & Electric Company has shut down its work in the Big Bend of Pit River almost completely. One hundred and fifty men employed at Intake and Cove, the two ends of the seven mile tunnel under construction, have been laid off. Only fifteen men are left on the job that is to cost \$17,500,000 to complete. The company explains that the shutdown is due to the difficulty of getting supplies into the Big Bend during the winter.

NEVADA CITY, CAL.—The big power plant at Rome, on the South Yuba river, the first plant of the South Yuba Power Company, predecessor of the great system of the Pacific Gas & Electric Company, is being scrapped. The plant is situated in an inaccessible place and hoists are necessary to lift the material to the bluff above. It is stated that the electrical appliances are bringing more as scrap than they cost new nearly twenty years ago. The plant is superseded by other plants of the same system.

OAKDALE, CAL.—Report on the use of storage water in two districts was made to the Oakdale board, by Engineer Griffin of the South San Joaquin district at a meeting last week. Mr. Griffin visited the reservoir with power company superintendent G. R. McDonald and told of the condition of various reservoirs. Mr. Griffin recommended that the district install current meters and also permanent wires at the Stan-

islaus power house, and at the mouths of the north and south forks of Stanislaus River.

MOKELUMNE, CAL.—What is said to be the second largest irrigation project ever planned in California is to be built in the watershed of the Mokelumne River and the Dry Creek section, according to filings for water rights which have just been made with the state water commission. The project contemplates the reclamation of lands in Amador, Sacramento and San Joaquin counties, a tract of 240,000 acres. The consulting engineers are Duryea, Haehl and Gilman of this city. The contemplated project is to cost \$10,500,000 and will require about twelve years to complete.

THE PACIFIC SOUTHWEST

PHOENIX, ARIZONA.—The Ray Electric and Telephone Company has been incorporated here.

MANHATTAN BEACH, CAL.—A resolution of Intention has been adopted by the city trustees for the lighting of the Strand.

DOUGLAS, ARIZ.—The Douglas Traction & Light Company is contemplating building an extension to Pirtle in the near future.

OROVILLE, CAL.—The owners of the Bloomer Hill quartz mine, a famous producer of earlier days, plan the erection of a hydroelectric plant.

LOS ANGELES, CAL.—The contract for installing an ornamental lighting system in Walnut Park lighting district has been awarded to D. A. Tamplin.

SAN DIEGO, CAL.—The Electric Supply Company has been incorporated here by C. H. Heilbron, August H. Biewener, S. L. Hall, R. J. Zing and E. V. Winnek.

TAPCO, ARIZ.—The new electric plant of the Arizona Power Company in Tapco has been started, assuring an adequate supply of power for mining interests around Jerome.

PLACENTIA, CAL.—An election held for the purpose of curing a defect in the original organization of Placentia Lighting District resulted in a unanimous vote in favor of the same.

BRAWLEY, CAL.—A resolution has been passed by the city council instructing the city engineer to report upon the feasibility and probable cost of the installation of a municipal electric plant.

LOS ANGELES, CAL.—The Hammond Electric Protection Company has been incorporated here with a capital stock of \$250,000, by W. D. Hammond, C. E. Rees, W. I. Gilbert, F. C. Mason and B. N. Hammond.

VENICE, CAL.—Petitions are being circulated in Venice, Cal., asking the "powers that be" to act for a one-telephone system in that city. The Santa Monica Bay Merchants' Association is fathering the movement.

PASADENA, CAL.—The city commission have decided for the city not to purchase the physical plant of the Southern California Edison Company or tie itself up to the proposed thirty-year contract, to purchase power.

SAN DIEGO, CAL.—It is claimed that the line of the La Jolla Beach Railway is to be electrified soon. Until an electric line, operating on an adequate schedule is established, an auto bus line will ply between La Jolla and San Diego.

CALEXICO, CAL.—The electric light plant, owned and operated by the northern district of Lower California, is the latest project to be set on foot in Mexicali. Meetings are being held daily and a definite announcement of the plans is expected soon.

SNOWFLAKE, ARIZ.—Steps have been taken to organize a company to install an electric light and power plant to supply electricity in Snowflake and Taylor. The company will be capitalized at \$50,000. The stockholders of the Snowflake & Taylor Irrigation Company are interested in the project.

LOS ANGELES, CAL.—The Los Angeles Railway Company has agreed to build a spur line to the new Los Angeles High School. The extension will be built up Tenth street, thence through a short private street in Bowers Tract to Country Club drive, and will terminate within a block of the school.

LOS ANGELES, CAL.—A merger of the telephone companies in Glendale, Burbank and the adjacent territory in Los Angeles county is proposed in a petition filed with the State Railroad Commission by the San Fernando Valley Home Telephone Company and the Pacific Telephone and Telegraph Company.

SANTA BARBARA, CAL.—The city council has instructed the city engineer to procure data and prepare estimates of the cost of utilizing certain water projects for developing power. The estimated cost of the proposed Mission Canyon power plant is \$146,368 and for a plant at Gibraltar dam, \$66,000.

MAGDALENA, N. M.—The Reserve Long Distance Telephone Company, which operates in Socorro county, New Mexico, is now installing a telephone line which will extend from Reserve to Magdalena by way of Datil; also from Datil to Quemado in the northern section of the county. The central office will be situated in Reserve.

TUCSON, ARIZ.—According to a report of the city engineer to the city council, it would cost about \$17,600 to light the new paved streets here. About 168 one-light standards will be needed and 16 five-light standards. It was decided to delay the matter a few months on account of present high cost of materials and the difficulty of obtaining delivery.

SAN DIEGO, CAL.—It is reported that the San Diego and Southeastern Railway Company is considering plans for building an electric railway into the Mountain Empire from the present terminus at Lakeside to Santa Ysabel, at the foot of Julian grade. It is said that considerable work has already been done in the matter of securing rights of way for the line.

VENTURA, CAL.—Sealed bids will be received by the city clerk up to Nov. 19th, for the construction and installation of ornamental street lights in Street Lighting District No. 1, in accordance with specifications and plans for said work on file in the office of the city clerk and city engineer. Said work consists of installation of 52 ornamental concrete street lights.

LOS ANGELES, CAL.—Surveys have been made for improvements in the Pacific Electric Railway Company's roadbed on Santa Monica Boulevard in Sawtelle that mean an outlay of \$130,000. New and heavier rails will be laid the entire distance from the westerly to the easterly city limits, and the roadbed given a heavy rock ballasting and paved with oil and macadam.

KINGMAN, ARIZ.—That the giant dam across Colorado River at Diamond Canyon will be built as soon as war conditions become settled is the belief of E. H. Carpenter, who has been engaged in making hydrographic prints for the eastern capitalists proposing to build the project. The plan is to construct the big electric plant to generate electricity for the whole of northwest Arizona.

ESCONDIDO, CAL.—Surveyors are now staking out a route and securing easements for an electric power line into San Pasqual valley. The plan of the San Diego Consolidated Gas & Electric Company, builders of the line, is to install the improvements within the coming two months if possible. The line will be a pole, copper wire circuit, three-phase and capable of handling a big business.

LOS ANGELES, CAL.—The executive committee of the People's Power Bond Committee has given consideration to the advisability of having a power bond election in the near future, also to the proposed power agreement between Los Angeles and Pasadena to supply the latter with aqueduct power. It was the consensus of opinion that the present is no time to submit a bond proposition. No definite plan has been outlined.

YUMA, ARIZ.—At a regular meeting of the city council the members unanimously passed a resolution instructing the city recorder to communicate with F. E. Trask of Los Angeles and have him endeavor to obtain an option on the existing water, power, light and gas plants in Yuma, as a basis for an action in the direction of municipal ownership. The council has virtually decided to call an election for the voting of bonds to the sum of \$300,000 for the purpose of purchasing the old plants, or installing new ones.

INTER-MOUNTAIN DISTRICT

ARROW CREEK, MONT.—The Stanford Northern Telephone Company has incorporated here.

BOISE, IDA.—The city council has authorized an issue of \$1800 in bonds for the Harrison Boulevard lighting district.

MALTA, MONT.—Geo. W. Kemper, Minot, has been awarded contract for installing electric light system at \$39,000.

MOORE, MONT.—Montana Power Company is starting the development of a large power project in Stillwater county at the foot of Mystic Falls.

GREAT FALLS, MONT.—The Montana Power Company will erect a modern downtown substation of brick and concrete to cost about \$150,000 to \$175,000.

DENVER, COLO.—The Colorado Power Company has sold to Denver bankers \$100,000 of 7 per cent cumulative preferred stock, which is being offered at par and dividends.

HELENA, MONT.—The Montana Power Company will construct a substation at Great Falls, Mont., at a cost of about \$150,000. The building will be of fireproof construction, 90 x 148 feet.

MONTICELLO, UTAH.—The Blue Mountain Irrigation Company is contemplating an issue of \$60,000 in bonds, it is reported, the proceeds to be used for improvements to its light and water plant.

POPLAR, MONT.—The Mr. Thomas who recently took over the lighting plant at this place reports that he was unable to secure the necessary equipment and will be unable to make the extensions planned.

CARSON CITY, NEV.—Attorney General Thatcher has filed a complaint in the Supreme Court of Nevada asking that the Reno Traction Company, which operates a street car system, be deprived of its franchise for neglect to repair the streets.

OGDEN, UTAH.—At a session of the City Commissioners recently the application of the Utah Light and Power Company for a pole line through a portion of Glenwood was recommended by Commissioner Miles L. Jones and adopted by that body.

OGDEN, UTAH.—Automatic Controller & Manufacturing Company has been organized with a capital of \$100,000. The company will manufacture electrical machinery. Cleveland Redfield is president; J. W. O'Brien, vice-president; William Stone, secretary, and Thomas L. Whitehill, treasurer.

WHITEFISH, MONT.—A. P. Tills, of Kalispell, a representative of the Northern Idaho and Montana Power Company, circulated a petition to property owners here for the purpose of installing a better lighting system. It is proposed to put lights at all street corners and intersections of streets and alleys.

GRANGEVILLE, IDA.—Work is progressing rapidly on excavation for the dam which the Grangeville Light & Power Company will build across the South Fork of the Clearwater river, at a point between the power house and the present dam. Present calculations are that the dam, which will be of concrete, will be completed within six months.

SOUTH MISSOULA, MONT.—According to an announcement, surveys will be made this fall for an electric railway from South Missoula to Flathead Lake, Mont. This will be

under the supervision of N. D. Miller, formerly chief engineer of the Great Northern Railroad. It is stated that the electric railway will connect with the big ferry boats to be operated by the Flathead Lake Hotel Company.

BOISE, IDA.—Idaho Electric Company, which has heretofore been a Salt Lake City concern, has now become a strictly Boise (Idaho) company, a group of the employees who have been connected with the store for several years having purchased the Salt Lake interests. S. Gwaitney is president of the new company and L. R. Walker, secretary. The firm has been transacting business in Boise for twelve years.

ELY, NEV.—A hydroelectric development plan, destined to provide power to the huge copper mines at Ely and its vicinity, has been submitted to Commissioner of Corporations H. L. Carnahan for his approval. Frank B. Ench of Oakland is behind the project and announces that the initial installation of 4800 horsepower of electrical energy will entail an expenditure of \$1,200,000. The company expects to be furnishing at least 10,000 horsepower within three years.

BUTTE, MONT.—In a report to the mayor and city council the city electrician recommends the complete reorganization of the city lighting system. The city is still using the same style of lamps in the residence section that was in use 15 years ago. He also recommends that the city secure an estimate for maintenance on 400-cp. 15-amp. Mazda lamps from the Montana Power Company, to be operated on the company's lines, and that the city purchase 470 Mazda pendant lamps, to replace the old-style carbon lamps now in use. New lamps, it is estimated, will cost \$6,500 installed.

LOVELAND, COLO.—The municipal lighting proposition has again become active, through the action by city council in authorizing council's light committee to proceed with sale of bonds authorized at a special election held a year ago and the completion of lighting plant and distributing system. This step follows closely on refusal of Western Power & Light Company to sell its distributing system to the city on any terms short of a 10-year contract to furnish the city with all current required for maintenance of the system. The next step toward completion of plant will be the building of a pipe line, which is to carry water for the generation of power to a point above the plant. A dam has been constructed.

SALT LAKE CITY, UTAH.—A complete schedule was filed with the State Public Utilities Commission by the Mountain States Telephone and Telegraph Company. An accompanying letter says that the tariffs given as being in effect at Milford are not as yet in force and will not be until the new exchange building there shall have been completed. At that point the business rate is to be increased from \$36 to \$42 per year, and that the new two-party line tariff will be \$36 annually.

DENVER, COLO.—Acquisition of the business of the Boston-Colorado Electric Company, competitor of the Colorado Power Company in the Idaho Springs district, is reported by the Colorado Power Company. The Colorado Power Company acquired only that part of the distribution system which was necessary for carrying on the business. Lines duplicating the system already operated by the Colorado Power Company were removed.

SALT LAKE, UTAH.—The Utah Basin Construction Company has been incorporated for \$100,000 to take over the Myton Canal & Irrigation improvements to water 60,000 acres of land, in four parcels, in the Utah basin. The company is being financed by Zion's Savings Bank & Trust Company. There have been homesteaded 40,000 acres of this land since it was thrown open for entry in September. There are from 500 to 800 farmers under the project, which is at an altitude of 5000 feet, the entire acreage being bench land. There is said to be 600,000 acre feet of water available.

ALPHABETICAL INDEX TO ADVERTISERS

The letter and number before each name are used in the classified page following

- | | |
|--|---|
| A-1 American Ever-Ready Works of National Carbon Co
Los Angeles; 755 Folsom St., San Francisco; Seattle. | M-3 Moore & Co., Charles C..... 20
Van Nuys Bldg., Los Angeles; Spalding Bldg., Portland;
Kearns Bldg., Salt Lake City; Sheldon Bldg., San Francisco;
Mutual Life Bldg., Seattle; Santa Rita Hotel Bldg., Tucson. |
| A-2 Associated Engineering & Supply Co.....
San Francisco, Southern Pacific Bldg., Los Angeles-Portland, Vancouver, B. C. | N-1 Nason & Co., R. N.....
151 Potrero Ave., San Francisco. |
| A-3 American Electric Heater Co.....
Detroit, Mich. | N-3 National Lamp Works of G. E. Co..... 23
(All Jobbers.) |
| A-4 American Conduit Mfg. Co..... 23
(See Pacific States Electric Co.) | N-4 New York Insulated Wire Co.....
629 Howard St., San Francisco. |
| B-1 Baker-Joslyn Company.....2-3
71-75 New Montgomery St., San Francisco; 526 First Ave. South, Seattle; 353 Second St., Los Angeles. | N-6 National Carbon Co..... 18
Cleveland, Ohio. |
| B-2 Benjamin Electric Manufacturing Co.....
590 Howard St., San Francisco. | O-1 Okonite Co. (The)..... 28
(All Jobbers.) |
| C-1 Century Electric Co..... 5
906 So. Hope St., Los Angeles; 56 Natoma St., San Francisco; 65 Front St., Portland, Ore. | P-2 Pacific States Electric Co..... 25
236-240 So. Los Angeles St., Los Angeles; 61-67 Fifth St. No., Portland; 200-210 Twelfth St., Oakland; 575 Mission St., San Francisco; 570 First Ave. So., Seattle; 402 Paulsen Bldg., Spokane, Wash. |
| C-3 Crocker-Wheeler Co..... 11
87 New Montgomery St., San Francisco; 228 Central Avenue, Los Angeles. | P-3 Peerless Electric Co..... 1
Warren, Ohio; Rialto Bldg., San Francisco. |
| C-4 Cutler-Hammer Manufacturing Co.....
579 Howard St., San Francisco; Morgan Bldg., Portland, Ore.; San Fernando Bldg., Los Angeles. | P-4 Philips Wire Co. 22
Eighth and Santee Sts., Los Angeles.
84 Marcon St., Seattle; 807 Mission St., San Francisco; |
| C-5 Crouse-Hinds Company..... 4
Syracuse, N. Y., U. S. A.
New York, Boston, Cincinnati, Chicago. | P-5 Pierson, Roeding & Co..... 20
Pacific Electric Bldg., Los Angeles; Rialto Bldg., San Francisco; Colman Bldg., Seattle. |
| D-1 Detroit Fuse & Manufacturing Co..... 21
1404 Rivard Street, Detroit, Mich. | P-7 Pittsburgh Piping & Equipment Co..... 28
Monadnock Bldg., San Francisco. |
| D-2 Davis Slate & Mfg. Co..... 20
Chicago, Ill. | S-2 Society for Electrical Development..... 6
United Engineering Societies Bldg., New York City. |
| D-3 Detroit Insulated Wire Co..... 22
71 New Montgomery St., San Francisco; 353 East Second St., Los Angeles; 526 First Ave. South, Seattle. | S-3 Sangamo Electric Company.....
Springfield, Ill.; San Francisco, 37 Stevenson St.; Los Angeles, San Fernando Bldg. |
| E-1 Edison Lamp Works of General Electric Co.....
Rialto Bldg., San Francisco; 724 So. Spring St., Los Angeles. | S-4 Southern Pacific Co..... 8
Southern Pacific Bldg., San Francisco. |
| E-2 Edison Storage Battery Supply Co..... 9
206-8-10 First St. (near Howard), San Francisco. | S-5 Sprague Electric Works..... 20
Rialto Bldg., San Francisco; Colman Bldg., Seattle; Corporation Bldg., Los Angeles; Electric Bldg., Portland; Paulsen Bldg., Spokane. |
| E-3 Electric Agencies Co..... 5
279-283 Minna St., San Francisco; 419-421 E. Third St., Los Angeles; 1252 First Ave. South, Seattle. | S-6 Standard Underground Cable Co..... 18
First National Bank Bldg., San Francisco; Hibernian Bldg., Los Angeles; Central Bldg., Seattle, Wash.; 815 Newhouse Bldg., Salt Lake City, Utah. |
| E-4 Electric Storage Battery Co..... 20
1536 Bush St., San Francisco. | T-1 Thomas & Co., R.....
Pacific States Electric Co. and Western Electric Co., Pacific Coast Representatives. |
| E-5 Electric Railway and Manufacturers' Supply Co..... 22
34 Second St., San Francisco. | T-2 Tubular Woven Fabric Company..... 2
Pawtucket, R. I. |
| E-6 Electric Controller & Mfg. Co., The.....
Cleveland, Ohio. | V-1 V. V. Fittings Co..... 3
Philadelphia. (See Baker-Joslyn Co.). |
| F-1 Faries Mfg. Co.....
Decatur, Ill. | W-1 Wagner Electric Manufacturing Company.....
St. Louis, Mo. |
| F-3 Federal Sign System (Electric)..... 10
618 Mission St., San Francisco. | W-2 Western Electric Co.....
Eighth and Santee Sts., Los Angeles; 1900 Telegraph Ave., Oakland, Cal.; 680 Folsom St., San Francisco; 84 Marion St., Seattle; 45 North Fifth St., Portland, Ore. |
| G-1 General Electric Co.....26-27
724 So. Spring St., Los Angeles; Worcester Bldg., Portland; Rialto Bldg., San Francisco; Colman Bldg., Seattle; Paulsen Bldg., Spokane. | W-3 Ward-Leonard Electric Co.....
Mt. Vernon, New York. |
| G-3 Garland & Affolter Engineering Co..... 28
Rialto Building, San Francisco. | W-4 Westinghouse Electric & Manufacturing Co.... 13-14
50-52 East Broadway, Butte; Van Nuys Bldg., Los Angeles; Couch Bldg., Portland; 212 So. W. Temple, Salt Lake City; First National Bank Bldg., San Francisco; Second and Cherry Sts., Seattle; Paulsen Bldg., Spokane. |
| H-1 Habirshaw Electric Cable Co., Inc..... 11
(See Western Electric Company.) | W-6 Westinghouse Lamp Co..... 12
(See Westinghouse Electric & Manufacturing Co.) |
| H-2 Hemingray Glass Co..... 22
236-240 So. Los Angeles St., Los Angeles; 345 Oak St., Portland; 807 Mission St., San Francisco. | W-8 Western Pipe & Steel Co.....
444 Market St., San Francisco; 1758 North Broadway, Los Angeles. |
| H-3 Howell Electric Motors Co..... 28
Howell, Mich.; Rialto Bldg., San Francisco. | W-9 Weston Electrical Instrument Co.....
109 Weston Ave., Newark, N. J.; Frank E. Smith, 682 Mission St., San Francisco. |
| H-4 Hubbard & Co..... 24
(See Pacific States Elec. Co.) | Y-1 Youngstown Sheet & Tube Co..... 5
Youngstown, Ohio. (See Electric Agencies Co.) |
| H-5 Hotpoint Electric Co.....
Ontario, Cal. | |
| H-7 Hurley Machine Co..... 25
New York and Chicago. (See Pacific States Electric Co.) | |
| L-1 Landers, Frary & Clark..... 19
150 Post St., San Francisco, and all jobbers. | |
| L-2 Locke Insulator Manufacturing Co..... 10
(See Pierson, Roeding & Co.) | |
| M-2 Moloney Electric Co.....
St. Louis, Mo.; Rialto Bldg., San Francisco. | |

JOURNAL OF ELECTRICITY

VOL. XXXIX NO. 11 SAN FRANCISCO, DECEMBER 1, 1917 PER COPY, 25 CENTS

Greetings

AS this issue of the Journal of Electricity goes out to every important port in the countries bordering the Pacific Ocean, it carries with it greetings from men of the electrical industry of the United States. In this the thirtieth year of its service to the upbuilding of the electrical industry, the Journal of Electricity now extends to you electrical men who dwell in every port and clime of the Pacific the message of good will recently unanimously passed by a gathering of prominent men from every branch of the industry in the United States of America:

"Be It Resolved, That the President of this gathering of electrical men is hereby authorized to communicate with organizations of a similar nature both in cities of the Pacific States of America and in the countries that line the great Pacific Ocean, to express to them friendly greetings and the desire of this organization to do everything within its power to forward friendly commercial and engineering relations with all the neighboring countries that line its borders—commercial and engineering relations that will be so helpful in character and so free from a spirit of domination as to unite forever these great growing countries into one indissoluble chain of mutual helpfulness."



A written word of approbation from you endorsing the spirit of this movement addressed to the President of the League, care Journal of Electricity, San Francisco, will help in giving this movement a substantial start and aid in the early calling together of a Pan-Pacific Committee for discussing problems of standardization in commercial and engineering practice.





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CLOTILDE GRUNSKY, Associate

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SAN FRANCISCO, DECEMBER 1, 1917

NUMBER 11

Contents

PRESENT STATUS OF RAILWAY ELECTRIFICATION	490
That the electrification of two great railway systems has proved a success is shown by the records of the first year's operation under electric motive power.	
REDUCING SEEPAGE IN EARTH RESERVOIRS—by S. T. Harding	494
The question of the type of reservoir to supplement the electric pumping plant is here considered from the viewpoint of ultimate economy.	
THE VALUATION OF RESERVOIR LANDS IN THE SAN FRANCISCO BAY REGION—by C. E. Grunsky	500
The value of the service rendered in impounding the waters as well as the value of the real estate, if used for other purposes, must both be taken into account in valuing reservoir sites.	
AN EMPLOYMENT SERVICE	507
A service card for the use of subscribers who are looking for positions has been issued by the Journal of Electricity in the enlargement of its Service Department.	
BREAD AND BUTTER BUSINESS	508
By acting as agent for a manufacturing concern in the exchange and repair business the contractor-dealer may build up an attractive income on the side and eventually lead up to sales from his own stock.	
WESTERN IDEAS	510
Christmas Advertising for Christmas Sales—Electrical Monkey Business—Christmas Windows—A Preholiday Sale—A Store Paper.	
THE JOBBER AND THE CONTRACTOR-DEALER ASSOCIATION—by W. S. Berry	512
The jobber is vitally interested in the prosperity of his customers and hence in the encouragement of Contractor-Dealer Associations.	
HOW TO REDUCE THE COST OF MERCHANDISING—by W. M. Deming	514
The duplication of effort by the manufacturer, central station and dealer might well be avoided if the situation were more effectively handled locally.	
EDITORIALS	487
The Christmas Electrical—The New War Service Committee in California—Why Engineering Colleges are a Failure—Engineering in the Pan-Pacific Area—The Electrification Problem—The Saving of Waste Power in the Industries—The New Journal Service.	
How the West is Helping to Win the War—III 486	
(Frontispiece)	
Before Electricity	496
New Radio Plant in Hawaii	496
Electricity in a Montana Mine	497
Short Journeys in Pacific Lands	498
Women in the Industry	503
Moisture Content of Oils—by Robert Sibley and Chas. H. Delany	504
Silhouette Highway Lighting—by S. J. Lisberger	509
A Possibility of New Business	509
Marine Wiring	513
Special Lighting for Multnomah Field—by F. H. Murphy	515
Adjustable Sockets in Lighting—by J. W. Morris	515
The Oregon Association of Electrical Contractors and Dealers	516
Technical Hints—by George A. Schneider	517
Notes on the Law of Patents—by Wm. K. White and H. G. Prost	519
Sparks—Current Facts, Figures and Fancy	521
Personals	522
Meeting Notices for Electrical Men	524
Builders of the West XVIII—Charles Watson Burkett	524
Happenings in the Industry	526
Latest in Everything Electrical	528
Good Books and Bulletins for Electrical Men	529
New Electrical Developments	530

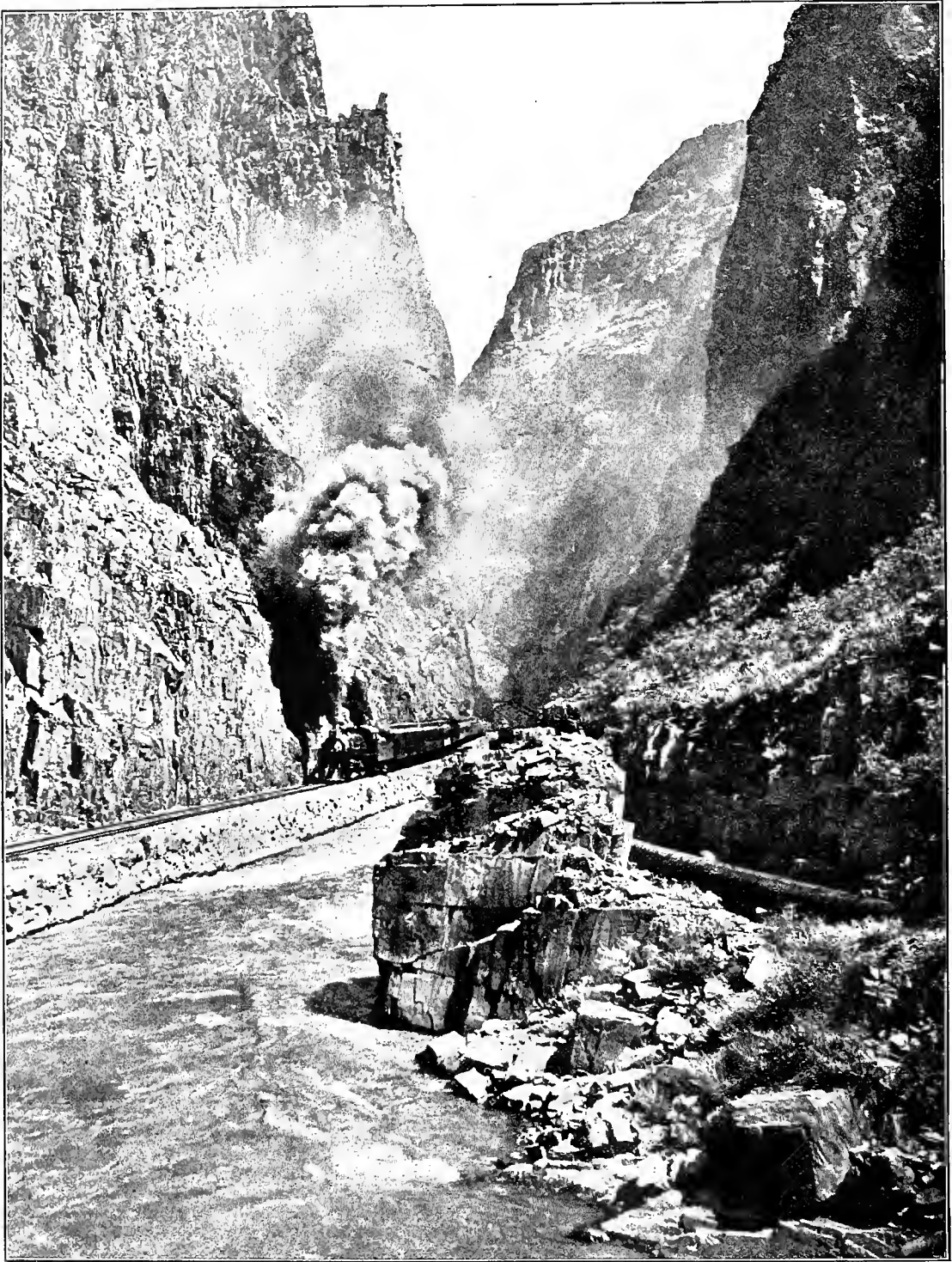
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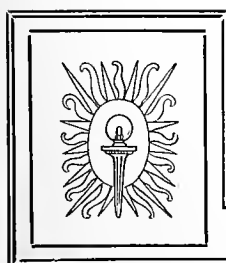
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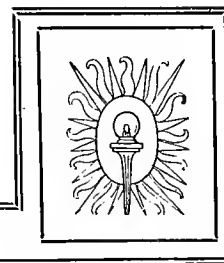


HOW THE WEST IS HELPING TO WIN THE WAR—III

Thoughtful study in railway electrification and in possible saving of fuel is being made throughout the massive passes of the great mountain railroad divisions of the West, looking toward a utilization of the giant water powers that trail their way beside the transcontinental systems which are now steam operated. Though a task of this magnitude must of necessity take much time—perhaps years—for its consummation, yet in the ultimate, the resulting saving in fuel supply can hardly be overestimated in its effect upon the commerce and industry of the world.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

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The Christmas Electrical

The very word "electrical" connotes to the thinking mind a subtle, energizing, thrilling, life-giving something that no other word in the articulation of the human tongue can transmit. In these strenuous times, when need is felt on all sides so keenly for a revitalizing, cheering influence, can not we as members of a great industry, along with our splendid array of material ware that we send out to an admiring and appreciative world, reflect more and more in our every act the very mind picture of the electrical season of the year in which we live, and thus transmit the spontaneity and life-giving cheer that can be expressed alone in but three words of the English Language — The Christmas Electrical.

The President of the United States and the National Council of Defense have frequently called attention to the necessity of conservation of fuel.

War Service Committee in California

Throughout practically the entire West a shortage in power supply to meet the vast demands now placed upon the industrial activities of this section, combined with the approaching dangers of a fuel shortage especially in crude petroleum, have led thoughtful men of the industry to question as to how best true conservation of hydroelectric power may be brought about.

This discussion of how best to "hooverize" electrical energy finally reached its climax at a recent gathering of men of the electrical industry in central California. Acting as hosts for the occasion the San Francisco Electrical Development and Jovian League invited the California Railroad Commission, including its electrical engineer, to be guests at a mass meeting of men of the industry in the Palace Hotel. The meeting was a large and enthusiastic one. Talks made at the luncheon dealt with the closer co-operation of the producers of electricity and the Railroad Commission in meeting the new problems of public service raised by the war emergency.

These two things were emphasized by the speakers:

1—There is a very narrow margin between the supply and the demand for electricity in the West, and consumers generally should join in conserving it in every practical way.

2—The recent order of H. A. Garfield, United States Fuel Administrator, restricting the use of street display lights after certain hours, does not apply to districts where electricity is produced by water power

and oil fuel and is not dependent on coal, as it is in many Eastern communities.

President Thelen of the Railroad Commission said that an effort should be made in California to conserve fuel oil, the supply not being equal to the demand. Hydroelectric power, he said, should be developed to the highest point to supplant the use of fuel oil.

Continuing, Mr. Thelen said that the thing most needed is a careful survey of the field of electric energy from the viewpoint of what can be done to help the United States and to make the electrical generating companies—the producers—more helpful in the nation's task of winning the war.

Mr. Thelen suggested the appointment of a special committee to make the survey and to outline methods for closer co-operation between the producers and the Railroad Commission in meeting public service problems during the war.

In accord with the suggestion from the Railroad Commission and also in accord with the spirit of the meeting the following resolution was unanimously passed:

"Whereas, the San Francisco Electrical Development and Jovian League has as one of the objects of its existence 'to encourage a more extensive use of electricity and to generally promote the welfare of the electrical industry,' and

"Whereas, the President of the United States and the Council of Defense, have frequently called attention to the necessity of conservation of fuel;

"Therefore, Be It Resolved, That the Railroad Commission of California be requested to appoint a War Service Committee of which a member of the California Railroad Commission and a representative of the electrical engineering staff of the commission shall be members, to look into the hydroelectric situation of California and make definite, positive recommendations for interconnecting and co-ordinating

the hydroelectric lines of the State with the object of conserving fuel oil and of otherwise putting to the highest use the hydroelectric energies of the State for the public welfare."

The entire matter is one of vast public interest and it is to be hoped that similar action will be taken by men of the electrical industry in other commonwealths of the West.

This editorial is written not with the purpose of indicting engineering educational method in the past

Why Engineering Colleges are a Failure

but with the view of offering wholesome criticism for the broadening of this effort to meet the new world conditions now thrust upon us. In a word, its purpose is to point out a vastly broadened sphere of activity for the trained analytical mind. The question is, "Shall the engineer of the future grasp this great opportunity of service, or shall he retire to a narrow, limited field of purely technical practice that is largely mathematical, very limited in scope and of decreasing monetary remuneration?"

Prior to the opening of the great world war in 1914 engineers generally had viewed with considerable apprehension the growing difficulty of securing employment for the product of engineering colleges throughout the nation. Indeed this proved not only a problem for the younger men but among men of qualified standing in the engineering world much difficulty was experienced in securing positions in keeping with the financial dignity of the profession.

With the exigencies brought on by the present national crisis, an examination of the shortcomings of the product of engineering colleges has been made possible, and it is not difficult to offer suggestions as to how these shortcomings can be prevented in the future.

In the first place, the tremendous stride forward of the engineering profession during the past twenty years has vastly lessened the type of technical problems that formerly appeared for solution. In a word, the new era now upon us is wholly different from the one immediately preceding and as a consequence the engineering colleges of the country, pursuing the old line of curricula, must of a necessity prove failures in their preparation of young men for the solution of present-day problems.

To prepare analytical minds for the purpose of grappling with the truly engineering problems of the immediate future, the engineering colleges of the nation in general fail in giving these young men broad vision and in giving to the public the highest type of man best suited for the work in hand, because—

1. In general no selective system is used to pick men best suited for the task chosen as a life work. As a rule the student picks his course by considering only the lesser arguments—the passing popular vocation of the hour, because A has chosen it, or because father wants him to.

2. No attempt is made to place a reasonable limit upon the number that register in certain courses. In a word, the number of students in the various branches of engineering bears no relation at all to the need for men in the particular field chosen.

3. No well organized guiding, helpful hand is

given for properly placing graduates in employment after the work is completed.

4. Physical shortcomings and general physical unfitness for the life work undertaken is given too little attention.

5. Great engineering managerial opportunities of the present day need men versed in economics, accounting, banking and commercial law. Our technical graduates are woefully lacking in these points.

6. There are comparatively few big, strictly technical positions open in the present day, consequently the great emphasis in the college curricula on mathematical specialties limits the field of usefulness of many who might otherwise succeed if well grounded in the fundamentals of economics and business law.

7. Total neglect of public speaking for engineering students is a most serious handicap in after life. Witness for instance the awful stillness that follows some of our engineering speeches, and the unfavorable impression created, although the speaker may be a man of significant engineering attainment.

8. Little if any training in foreign languages is given in our engineering colleges. The need of the hour in the great international opportunities ahead calls for their use. Hence this is again a great handicap.

9. Written expression receives little attention in the engineering curricula and as for encouragement in technical writing, only a few students ever feel its invigorating influence.

10. Efficiency and method study are two prime factors in the success of the modern engineer. By far too little attention is given to this most important subject.

It is true that the years of college are all too limited for establishing the foundation work necessary for the high calling of the engineer of the future. But above all it must be remembered that the age in which the next generation is to live will be one in which an accurate business training is absolutely essential. Unless this fact is borne in mind and business methods and economic principles are inculcated into our young engineers our technical colleges must perforce prove failures in their high calling.

New ideas of engineering and commercial growth are constantly being brought forth. The closer drawing together of the nations that line the great Pacific has been receiving the thoughtful attention of many master minds during recent months. That the Pacific Ocean is to be the great arena for commercial activity in the coming generation is rarely denied by men who have given thoughtful study to the possibility of development in the growing countries that line its borders.

Engineers and commercial men of the Pacific States of America are keenly awake to this fact. The only problem that is perplexing is as to how the building of commercial and engineering relations shall be accomplished in order that the peace of the world may result and a permanency in this building status maintained.

Up and down the Pacific Coast and in the great cities of the interior, gatherings of engineers and men

of the industry interested in this problem, which means so much to the future life of the West, are discussing this matter.

That these relations should be built upon broad lines is conceded by all. In its last analysis competition means war and it ought to cease. To bring this about the development of the highest and truest spirit of co-operation attainable among engineers and commercial men of the Pan-Pacific Area is absolutely essential.

Let us remember, then, that co-operation in every human endeavor is the keynote of the hour. Can not we all subscribe to the principles expressed in a recent resolution by a large gathering of men of the electrical industry in the west which briefed the entire matter so beautifully, as follows:

"Be It Resolved, That the President of this Electrical Development League is hereby authorized to communicate with organizations of a similar nature both in cities of the Pacific States of America and in the countries that line the great Pacific Ocean, to express to them friendly greetings and the desire of this organization to do everything within its power to forward friendly commercial and engineering relations with all the neighboring countries that line its borders—commercial and engineering relations that will be so helpful in character and so free from a spirit of domination as to unite forever these great growing countries into one indissoluble chain of mutual helpfulness."

Copies of these resolutions are now being sent to every port in the great Pacific Area. Already several similar organizations in Pacific Coast cities have indicated their willingness to subscribe to the principles set forth in these resolutions.

The time is not far distant when a congress or convention may be called to consider many points that will make these resolutions of concrete helpfulness. Standardization of engineering and commercial practice is one problem that is the crying need of the hour and a committee from the various countries bordering the Pacific could do much in laying down the first fundamentals for meeting this great need.

One extremely interesting development due to the present world stress is the unquestioned exposure of the economic fallacy of separately operated units in power generation. The railway problem is another phase of this great present-day trend that is receiving much thought and study, and the one outstanding giant feature of this problem is the future electrification of the railways of the nation—especially those that cross the mountain passes or through districts where abundance of water power is available.

It is true that the sum of money to electrify a great system such for instance as would be necessary for the complete electrification of the Southern Pacific Lines is sufficient to stagger the imagination, still the public at large has now become used to thinking and talking in figures that formerly seemed unthinkable.

THE NEW JOURNAL SERVICE: The Journal of Electricity is now ready to announce the opening of an important type of Journal service. As stated in the editorial columns of the issue for Sept. 15, 1917, an employment department has now been put in full operation. Complete details of this interesting new work will be found on another page of this issue.

With this issue another feature is also added to our editorial and advertising pages. In order to acquaint our readers with important items of interest connected with the activities of the Journal's advertisers, a tie-in page between the editorial and advertising pages of the Journal has been added. This page is highly educative in value and should prove helpful to men of the industry in grasping a clearer view of the interesting and important lines carried by those using the advertising columns of the Journal, who may well be classed as national leaders in their respective lines of activity.

The whole world thought is in a state of flux. The one general principle to lay down from which to discuss present-day problems is "Does the proposed scheme meet an economic need for the people as a whole?"

On another page of this issue authentic data are set forth showing the results that have been accomplished by the electrification of the mountain division of the Chicago, Milwaukee and Puget Sound Railroad and also similar data from the operating costs of the Norfolk & Western Railroad.

With the conclusion of the world war vast armies of men are to readjust themselves and find avenues of support.

So long as Mother Earth is productive and so long as human brains and human hands stand ready to forward the highest economic development of the race no outlay in mere commercial exchange need bar the undertaking of a human task.

The husbanding of waste energies is taking place in industrial institutions of the West to a degree hitherto unthought of as possible.

The Saving of Waste Power in the Industries Perhaps no other problem has received more careful consideration than the enormous waste of heat energy carried away in the spent gases of the steam engine and the gas engine. Since the days of Carnot it has been thought that the irreversible cycle of the internal combustion engine made necessary the forever giving up of a hope that some inventor would some day recover the 60 to 80% waste energies of this type of prime mover.

While the irreversibility of the Carnot cycle is as true today in the theory of Thermodynamics as ever, still it is surprising to what limits waste energies of this nature are being recovered.

Take the case of the new industrial installation of the Hawaiian Sugar Refinery at Crockett, California, as an example. In this plant approximately two and one-half million dollars are being spent in refined improvements for power applications.

On January 1, 1918, the company will start the erection of a 4500 kw. generating plant, as it is estimated that it will prove cheaper to generate its own power than to purchase power from the great hydro-electric companies that serve the district.

This unique condition is brought about in the manufacture of sugar as every pound of exhaust steam from the steam turbines may be efficiently made use of in the refining process.

It is to be hoped that the gigantic losses in exhaust steam, commonly 60 to 80 per cent as stated above, can be more the subject of investigation. Such savings are indeed the higher class of conservation, for like the "ninety and nine" of old the one stray sheep brought again to the fold causes great rejoicing and incidentally a clear profit of 100% to the power user.

PRESENT STATUS OF RAILWAY ELECTRIFICATION

(The electrification of the railways of the nation is a problem that involves factors of such gigantic magnitude as to almost stagger the imagination. Yet the possible economic returns in conservation of coal and fuel oil combined with vast superiorities from almost every other conceivable viewpoint force thoughtful men to view with unusual interest the returns of records from present electrified lines throughout the nation. Here is authentic information on this subject which should prove of intense interest to our readers and of much timely import.—The Editor.)



The Master Controller on the Norfolk & Western Lines

& Western Railway electrification by A. H. Babcock, consulting engineer for the Southern Pacific Company, that has received nation-wide attention.

Since these various articles have appeared in the columns of the Journal of Electricity considerable investigation and inquiry have been made as to the actual costs of operation and maintenance of these two great systems of electrification. The executives of these organizations have been communicated with and the results of the inquiry have proven most illuminating. The information secured by the Mercantile National Bank of San Francisco, a correspondent of The National City Bank of New York, is interesting and timely. A few months back this banking institution gave out a statement from the superintendent of motive power of the Pennsylvania Railroad Company, showing that within the last five years that company has practically doubled the coal efficiency of its locomotives, at an increase of about 30 per cent in capital cost. Pursuing the same line of inquiry, to the sub-

stitution of hydro-electric power for steam power, a statement was given out from Vice-President Goodnow, of the Chicago, Milwaukee & St. Paul Railway Company, upon the results of electrical propulsion over its Rocky Mountain division, in October, November and December, 1916, as compared with steam propulsion in the corresponding months of 1915.

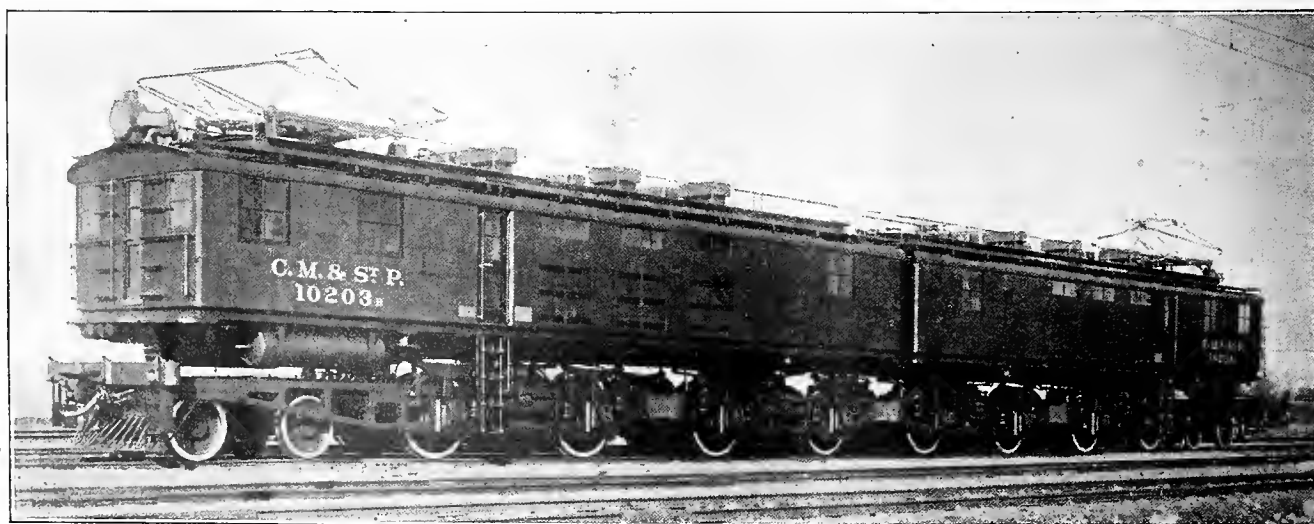
The statement does not go into comparative costs in dollars and cents, which would be a very complicated calculation, but that a conclusion has been reached favorable to electricity, at least under similar conditions, is evident from the fact that the company is now installing electrical equipment on its Cascades division.

The facts given by Mr. Goodnow show that electricity is decidedly superior to steam in operating efficiency, especially in cold weather, and if the use of electric power increases the capacity of a road, enabling more trains to be operated over the same tracks, of course that fact is a very important element in the total cost of supplying transportation. The superintendent of the Rocky Mountain division has expressed the opinion that to have handled the traffic in the winter of 1916 without electricity, double tracking would have been necessary.

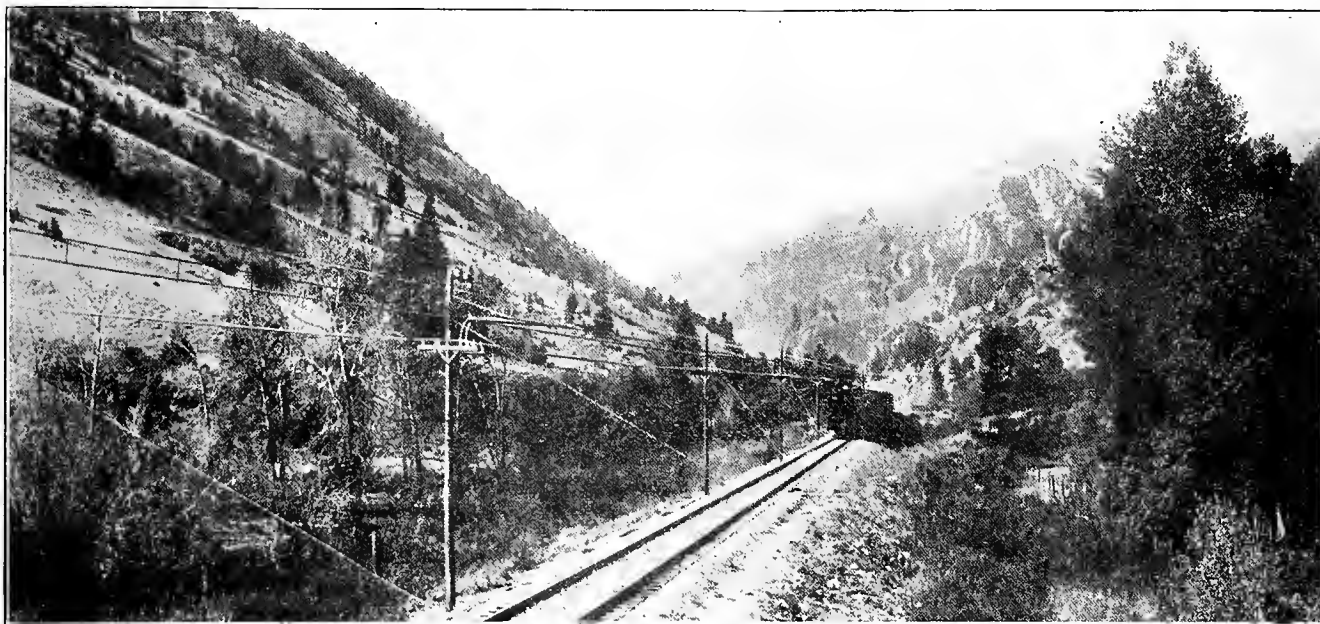
In this connection it may be added that an important consideration in the decision of the Pennsylvania Railroad Company to electrify its suburban service between Philadelphia and Paoli was the fact that it could thereby avoid a costly enlargement of its Philadelphia terminal.

An interesting feature of electrical propulsion is the fact that 11.3 per cent of the power consumed during the months under review was generated by the trains themselves on the down grades, but Mr. Goodnow says that this regeneration is reckoned as of minor importance compared with the ease and safety

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Electric Locomotives on the Chicago, Milwaukee & Puget Sound Railway



The "Olympian" entering a Montana Canyon. This train is electrically operated and equipped throughout

of handling the trains on grades, and the lessened wear and tear on equipment. Other authorities say that the most valuable feature of this power generation is the "dynamic breaking," or the holding of the train at a uniform speed on down grades without the use of air brakes. Longer and heavier trains and greater speed are possible than with the use of air brakes.

The summary of the record of steam and electric operation in the periods under comparison is given below:

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY CO.
Electrification Department

Data on Operation Under Steam in 1915, and Under Electricity in 1916									
Rocky Mountain Division		October		November		December		Total	
Passenger		Steam	Electr.	Steam	Electr.	Steam	Electr.	Steam	Electr.
1	Train or Train Engine Miles.....	39,426	40,169	41,276	40,549	38,628	38,519	119,330	119,237
2	Helper Engine Miles.....	4,738	.....	7,966	.....	12,048	.....	24,752	.....
3	Number Engines.....	13	7	13	7	13	7	13	7
4	Train Miles per Engine.....	3,040	5,730	3,180	5,800	2,970	5,510	9,190	17,040
5	1,000 K.W.H. at Power Co.'s Meters.....	.....	1,217	.....	1109.5	.....	1,152	.....	3478.5
6	K.W.H. per Train Mile.....	.....	30.3	.....	27.4	.....	29.9	.....	29.1
7	Coal, Total Tons.....	3,380	.....	4,150	.....	3,739	.....	11,260	.....
8	Coal, Pounds per Train Mile.....	171	.....	201	.....	193	.....	188	.....
Freight									
9	1,000 Ton Miles.....	98,512	125,522	93,228	130,848	91,122	107,717	282,862	364,087
10	Train Miles.....	60,666	65,400	58,014	63,299	58,257	57,311	176,937	186,010
11	Helper Engine Miles.....	16,605	7,022	20,422	7,544	19,336	5,591	56,363	20,157
12	Number Engines.....	42	15	41	15	44	15	43	15
13	1,000 Ton Miles per Engine.....	2,405	8,370	2,270	8,720	2,070	7,170	6,745	24,260
14*	Number Subdivision Trains.....	535	585	523	583	526	543	1,584	1,711
15*	Ton Miles per Train Mile.....	1,625	1,920	1,605	2,070	1,563	1,880	1,600	1,960
16	Total Time, Hours.....	6,094	5,022	5,946	5,084	5,785	4,429	17,825	14,535
17	Minutes per 1,000 Ton Miles.....	3.70	2.40	3.83	2.38	3.81	2.47	3.78	2.39
18	1,000 K.W.H. at Power Co.'s Meters.....	.....	4,696	.....	5,119	.....	4,528	.....	14,343
19	K.W.H. per 1,000 Ton Miles.....	.....	37.4	.....	39.1	.....	42.0	.....	39.4
20	Total Tons Coal.....	12,150	.....	13,670	.....	13,230	.....	39,050	.....
21	Pounds Coal per 1,000 Ton Miles.....	247	.....	294	.....	291	.....	276	.....

*"Subdivision Train"—One train over one Subdivision: Divide by 2 for trains over entire Division.

*"Ton-Miles per Engine-Mile" equals tons per train with one electric engine and short helper service, or with one steam engine and longer helper service. In this connection consider Item 17.

Total Regeneration over entire Division, month of November, equals 11.3% of consumption at motors.

Passenger on 2% grade, January 21-27, 1917—Regeneration = 42.8% of consumption at motors.

Passenger on 1.66% grade, January 21-27, 1917—Regeneration = 23.1% of consumption at motors.

Statement by Vice-President Goodnow

Chicago, August 31st, 1917.

The National City Bank,

New York City, N. Y.

Gentlemen:—

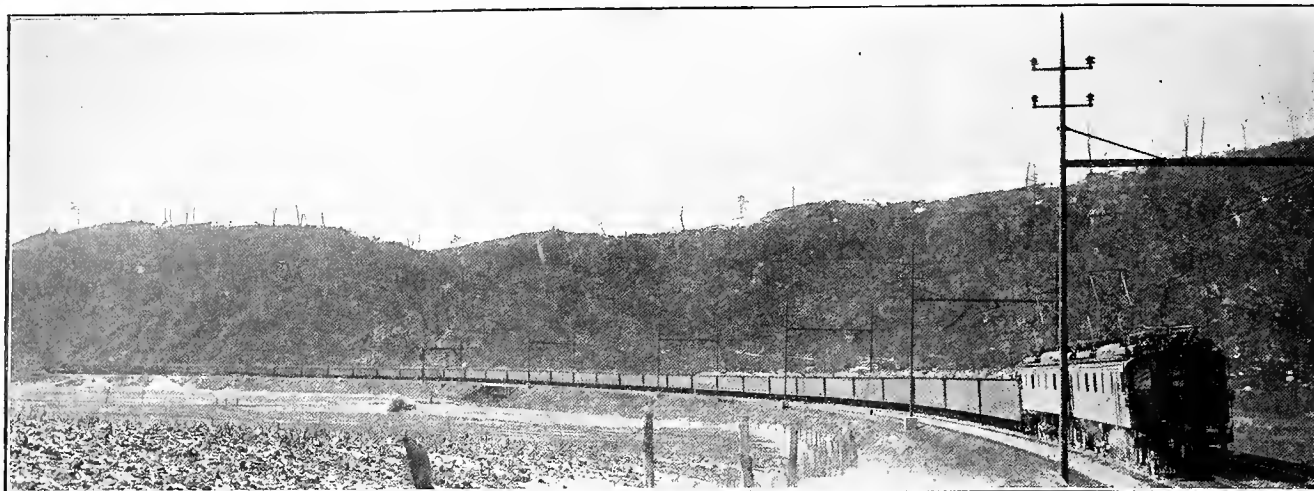
Referring to your letter of August 6th, I attach hereto a blueprint which shows you the approximate tons of coal used for October, November and Decem-

ber, 1916; item No. 7 for passenger service and item No. 20 gives the same information for through-freight service. The figures do not include coal used for switching or work trains, which figures I have not conveniently available. Item No. 5 of this table also gives the kilowatt hours used for passenger service, and item No. 18 gives the same information for through-freight service.

I might state, however, in this connection that the question of relative cost of fuel is only one of a good many items which affect the question of relative

economies under steam vs. electric operation, as I believe the following will indicate to you:

In the first place, although the figures shown on the blueprint show up favorably for electrical operation, they can by no means be considered as final, inasmuch as the comparative figures for steam operation represent the results of many years of effort and experience, while the figures for electricity are based



How Giant Haulage is Accomplished Electrically on the Norfolk & Western

on the use of apparatus and a system which is entirely new in many respects, and at the time the figures were prepared, on an operating experience of less than one year. The figures are given for the Rocky Mountain Division only, as they have not been compiled in a similar manner for our Missoula Division.

Harlowton is the eastern terminus of the Rocky Mountain Division, and is the station where electric operation begins. Deer Lodge is the western terminus of this division, while Three Forks, located about midway between the two above named points, was formerly a steam engine division point. Under steam operation, train engines were changed at Deer Lodge, Three Forks and Harlowton. Thus, a steam locomotive made about 113 continuous miles. At the end of that run it was put in the roundhouse or shop to have it cleaned, boilers washed, etc., and for any light repairs. This necessitated a large roundhouse and shop force at each of the three above mentioned points. Freight trains were tied up in the yards and there were the usual other costly and vexatious delays. All train and engine crews changed at each of the through subdivision points mentioned, except passenger train crews which ran from Deer Lodge through to Harlowton. Under steam, the cabooses and many of the engines were assigned which of course made it necessary to take the caboose from the train at each subdivision point.

With the introduction of electricity we were able to double what I may call the cruising radius of our locomotives. As far as the railroad is concerned, we have eliminated Three Forks entirely. All locomotives run the entire 226 miles from Deer Lodge through to Harlowton with only a light inspection at Three Forks of bearings and pantographs. The shop and roundhouse are entirely closed down, seven or eight miles of tracks have been removed and the comparatively large roundhouse force previously employed has been replaced by a single electrician. All locomotives and cabooses are pooled, the men being given suitable locker space to store their lanterns, flags, tools, etc. Through freight trains do not leave the main track and often are not switched at all. At Harlowton the engine is given a rough inspection and any light repairs made that are necessary. Detailed inspection and maintenance work is done at Deer Lodge.

The same change in operation as referred to above has been effected on the Missoula Division, Avery to Deer Lodge; in this case Alberton being the steam engine division point eliminated.

The blueprint being sent you also shows for the Rocky Mountain Division a comparison of locomotive performance for October, November and December, under steam operation in 1915, and electric operation in 1916. It should be understood that the figures given, while sufficiently correct for comparative purposes, as they are taken from the same report forms, are not to be considered as strictly accurate when considered individually, the forms being those from which the data could most conveniently be obtained.

Item No. 2 on the blueprint shows that helper engine miles increased under steam as the temperature decreased, this being due to the difficulty of "steaming" the locomotives during extremely cold weather and making it necessary to operate helper engines in connection with passenger trains, over long distances. This helper service for passenger trains, with its extra crew cost, switching delays, etc., has been eliminated under electricity.

By reference to item No. 3 on the print, showing the relative number of engines required for electric vs. steam operation, you will note that less than half as many electric locomotives are required compared with steam engines, for the same service.

Item No. 9 under freight data, "Thousands of Ton Miles" shows an average increase during the months of electric operation of 28.8 per cent over that of steam. For November the increase was 40 per cent. In this connection the superintendent of the division has stated that to handle the 1916 business, either electrification, or with steam,—double tracking, was necessary. The latter would of course have required extra motive power. Possibly the superintendent did not intend his statement should be taken literally, but in any event it is reasonable to assume that under the business conditions which existed during the period under consideration, and the resulting congestion, the steam figures would be, for steam, too favorable.

Item No. 11 indicates that under freight service and for the same ton miles, there would be over three times as many helper engine miles under steam as

under electricity, the cause for this being due largely to the same conditions as applied under passenger service.

Using the figures as they stand, we find from item No. 13, "Thousands of Ton Miles per Engine," that the electric engine handles about $3\frac{1}{2}$ times as many ton miles per month as the steam engine, and from item No. 17, "Minutes per Thousand Ton Miles," that the electric engine cuts from the time to do a given business, 30 per cent, partly by faster running and partly by heavier trains.

Item No. 15, "Ton Miles per Train Mile," is about the same as tons per train, and 22 per cent greater for electricity than steam.

As to the effects of regeneration on the power consumption, it will be noted that for the month of November, the amount of regenerated power measured at the locomotives was 11.3 per cent of the total power consumed at the motors. I may say, however, that the power saving features of regeneration is not considered so important by us as the increased safety and ease with which trains are handled on the heavy mountain grades and the saving in wear and tear on brake shoes and equipment.

Truly yours,

C. A. GOODNOW, Vice-President.

Norfolk and Western Railway

The Norfolk & Western Railway has been operating for over a year with electric power over 29 miles of heavy grades upon its Pocohontas division, which includes the passage over the Allegheny Mountains. It has a heavy coal movement to handle. The company has made a statement about its experience with electric propulsion, from which we take the following:

"In the development of this business the company has taken advantage of all modern methods in steam traction, in respect to the use of maximum weight trains and the most powerful type of locomotives, and has thus reduced the movements over the division to a minimum. But it was found that track capacity was frequently reached in normal service and that growth of business could be cared for only by very expensive physical reconstruction. Careful study of the possibilities and economy of electric traction for these special conditions resulted in the conclusion that it would be practicable to increase the train speed greatly and that this, together with the elimination of delays occasioned by coaling and watering of steam locomotives, would enable a greatly increased tonnage to be handled at a reduction in operating cost which would return a substantial profit above interest and depreciation charges on the electric equipment, thus postponing the necessity for new trackage and other additions which would not directly reduce operating costs.

" . . . Twelve electric locomotives have been provided for the service, replacing thirty-four Mallet steam locomotives. Each electric locomotive consists of two units weighing 135 tons, giving a total weight of 270 tons for the complete locomotive.

"Electric operation has been in service too short a time to give data as to performance, but it may be said that the estimates of increased capacity to be obtained from this equipment have been fully met and that an unusually heavy tonnage has already been handled without congestion. The movement of the heavy tonnage trains by electricity has been effected

with ease and smoothness; the trains accelerate promptly and without shock or jerk on the heavy grades, and it has been found that the full trains can be smoothly controlled by one head engine on the 2.5 per cent down grade by electric braking alone and at a uniform speed slightly above that of the regular running speed. The acceleration of one of these heavy trains is impressive as regards the amount of power required. Preliminary tests indicate that getting a train in motion up the grade requires as much as 11,000 electrical horsepower and that running at uniform speed up the grade requires 8,000 electrical horsepower to be delivered to the train. It is believed that no such amount of power has ever before been developed on a single train, either steam or electric, in regular service."

Railway Electrification After the War

The possibilities of railway electrification are especially interesting at this time, because they suggest a vast field open for construction work in this country and throughout the world, as soon as capital and labor can be had for it. There is naturally a feeling of uncertainty and apprehension as to industrial conditions after the war. The demand for war materials will fall off, the supply of labor on the market will be greatly increased, and it is a question whether all of this labor can be promptly placed in employment. It will be the most stupendous reorganization of industry ever known, and it is going to be a great social problem to accomplish this change without confusion, loss of confidence, and a period of stagnation. It is important that plans be laid on a large scale to take up the slack, and other countries are laying them. In this country, ready at hand, is the task of equipping the railroads, and other industries where practicable, to operate by electric power. The undertaking would involve an enormous amount of work and of many kinds. Hydro-electric plants would require in construction a great amount of labor, cement, steel, and heavy machinery. The demand for copper would take the place of the war demand for that metal, and keep the copper mines busy. The demand for electrical equipment of all kinds, including locomotives, would be very great, for the enlargement of the facilities for supplying electric power would cause electricity to be more generally adopted for all the industries. The amount of work in sight, if a general scheme of electrification was undertaken, would be sufficient to relieve the business community.

The danger will be in a pervasive feeling of uncertainty, causing men to wait with their own plans until they can discern the general trend, and waiting of itself slows down business. Large plans for the employment of labor which can be brought definitely forward at the critical time will serve to inspire confidence and support the whole situation.

The strength of the proposal is in the great amount of work of a semi-public character which it is possible to have done, and which would not only tide the country over the period of industrial uncertainty, but serve to put the country's industries upon a more economical basis permanently. Any reduction in the cost of power will strengthen the country's position in the competitive situation after the war. Every saving of this character will lessen the necessity for wage reductions after the war.

REDUCING SEEPAGE IN EARTH RESERVOIRS

BY S. T. HARDING

(Where the water furnished by the electrical pumps is not put into immediate use, the earth reservoir has come to be an essential factor in the equipment. The following article is therefore of timely interest, by an author who as irrigation investigator at the University of California, may be looked upon as an authority in this field.—The Editor.)



A small unlined reservoir used with a farm pumping plant

UNLESS constructed in fairly heavy soil some methods of treatment of earth reservoirs will be required in order to reduce seepage losses. The treatment may vary in extent and cost from a simple puddling of the soil in which the reservoir is excavated to the use of a concrete lining.

The rate of seepage loss in a reservoir must be much less than is permissible in earth canals. The area on which such loss occurs is relatively large and the rate of loss must be correspondingly reduced. A seepage loss of $\frac{1}{2}$ or 1 cubic foot per square foot of wetted area per day would represent favorable conditions in canals, in shallow reservoirs such rates of loss would be excessive.

Seepage losses exceed evaporation losses for all but the most impervious types of lining. On single days when warm winds have been blowing, evaporation losses as great as $\frac{3}{4}$ of an inch per day have been observed in the San Joaquin Valley on large reservoirs. The average loss, however, is much less than this. Even though full only part of the time, the evaporation from small reservoirs is usually continuous, taking place from the saturated soil forming the site when water is withdrawn.

The rate of seepage through a soil can be reduced by changing its mechanical condition without adding any outside material. Heavy soils may be puddled when wet so as to be nearly impervious. Such puddling may be accomplished by trampling with stock, usually sheep, as their feet being sharper pack the soil more thoroughly. Dragging with a heavy chain or other similar means may also be used. Such puddling may not be permanent where frost action takes place, such frost action is not found, however, in most of the locations in which the use of reservoirs is general.

Where the soil is not sufficiently heavy to retain water itself, treatment with a layer of heavy soil, mixing of manure with the soil, or oil or concrete linings may be used.

A puddle lining may be applied to a reservoir at a relatively low cost if the material can be secured within reasonable limits of haul. Such linings are successfully used on canals where the conditions of slope and velocity are much more unfavorable than in reservoirs. For small reservoirs a thickness of lining of 6 inches is usual, in some cases 4 inches may

give satisfaction if evenly spread. A cubic yard of material will cover 54 square feet 6 inches deep. To cover a reservoir having an area of 1 acre requires about 800 cubic yards if 6 inches thick and 540 cubic yards if 6 inches thick. Such puddle lining may cost less than 1 cent per square foot under favorable conditions of haul and placing. It is not generally used where the cost exceeds $1\frac{1}{2}$ or 2 cents per square foot. At a cost of 1 cent per square foot it would cost about \$150 to line an earth reservoir 100 by 100 by 4.

Seepage can be decreased by applying manure and working it into the surface. This may be used to render soils such as loams reasonably water tight. For lighter types of soils, such placing of manure may not reduce seepage sufficiently to be satisfactory.

Oil lining is being used on reservoirs with success in many instances. In other cases where not properly applied its effect has been only temporary. Oil linings have been tried on canals to reduce seepage and also on canals and canal banks to reduce vegetative growth. With canals such treatment has not generally fulfilled the expectations of the canal owners. With reservoirs the conditions for permanence are more favorable and better results are being secured. Methods and costs of applying oil were discussed in the issue of April 1, 1917. In India, good results with oil linings were obtained by oil linings blanketed with a foot of earth to protect the oil. Labor costs in this country make this method too expensive, although such linings will reduce seepage and be fairly permanent. Oil linings as generally used can usually be applied at a cost of about 1 cent per square foot, the cost varying with the price of oil and the length of haul required.

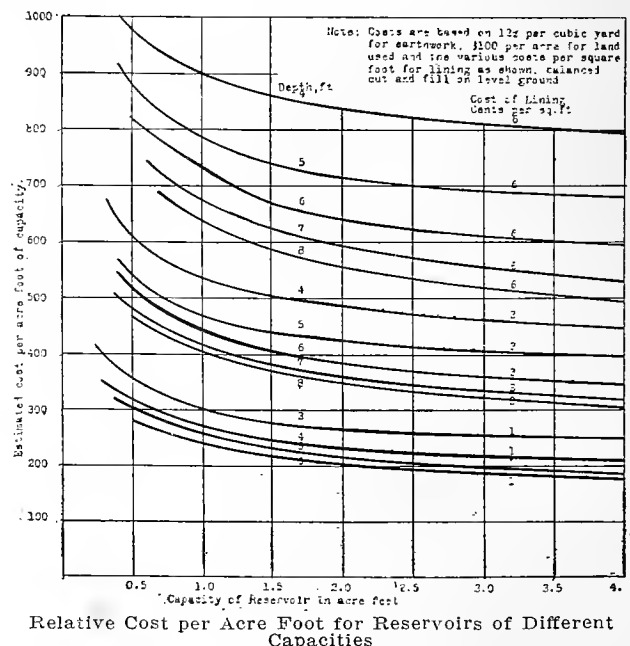


Table 1—Data on Small Lined Reservoirs

Size of Reservoir Inside at Bottom	Depth of Water	Capacity in Acre Feet	Capacity in Acre Feet	Capacity in Acre Feet	Estimated Cost of Reservoir Unlined	Estimated Cost of Reservoir Unlined	Estimated Cost of Reservoir Unlined	Estimated Cost of Lining	Estimated Cost of Lining	Estimated Cost of Lining	Estimated Total Cost	Estimated Total Cost	Estimated Total Cost	Estimated Total Cost per acre ft.	Estimated Total Cost per acre ft.	Estimated Total Cost per acre ft.
50 x 50	4	0.33	58	55	113	342	0.31	50	158	208	\$670	0.29	47	260	307	\$1060
	5	.45	75	63	138	307	.41	64	167	231	562	.38	57	292	349	917
	6	.58	86	70	156	269	.53	79	187	266	502	.48	70	323	393	820
75 x 75	4	.66	97	99	196	297	.63	85	279	364	580	.60	80	496	576	960
	5	.88	120	108	228	259	.83	97	298	395	476	.77	99	540	639	830
	6	1.12	142	121	263	235	1.04	125	324	449	431	.97	114	592	706	736
100 x 100	4	1.12	139	154	293	262	1.07	124	444	568	530	1.03	117	807	924	895
	5	1.45	168	168	336	232	1.39	147	480	627	450	1.33	138	858	996	750
	6	1.82	192	181	373	205	1.72	181	498	679	394	1.63	164	908	1072	658
150 x 150	4	2.35	230	304	534	227	2.29	208	891	1099	480	2.23	197	1655	1852	830
	5	3.03	280	323	603	199	2.93	253	933	1186	405	2.85	234	1726	1960	690
	6	3.74	328	341	669	179	3.61	302	960	1262	350	3.48	275	1806	2081	600
200 x 200	4	4.05	334	503	837	207	3.97	309	1467	1776	445	3.90	290	2802	3092	795
	5	5.15	402	527	929	180	5.05	366	1542	1908	380	4.95	338	2895	3233	655
	6	6.38	477	552	1029	161	6.20	430	1596	2026	325	6.02	399	2983	3382	560

Concrete linings may vary from a thin plaster coat to one having a thickness of 4 inches and laid or reinforced so as to reduce cracking due to temperature changes. Any concrete lining sufficiently strong to maintain itself without excessive cracking will satisfy the requirements of seepage prevention. The thickness of such linings is determined by the prevention of excess cracking or injury to the lining.

Concrete lining should be laid only on well settled banks. Where reservoirs are constructed by excavation within the banks, the bottom and lower portion of the banks will be in-cut and not subject to uneven settlement. Linings should not be placed on banks built by usual methods until they have been subject to rains and settlement. The bottom and sides should be carefully trimmed and rolled before lining.

The placing of concrete linings may be done by the owners of the reservoirs, but better results are usually secured by employing those experienced in such work, either by the day or on a contract basis.

For thin linings, resembling plaster linings as they are called, a mixture of 1 part cement to 3 or 4 parts of sand is usual. This would be used for thickness up to one or 1½ inches. For greater thicknesses gravel can be added, giving a concrete of 1 part cement to 2 parts sand and 4 parts gravel, for work where rich mixtures are desired. One part cement to 3 sand to 5 gravel may also be used. A thin mortar coat may be applied to the surface to increase the imperviousness. The maximum size of the gravel should not exceed about one-half the thickness of the lining.

The following table of average costs of concrete linings for canals is given in *Irrigation Practice & Engineering*, Vol. 11, by B. A. Etcheverry. These costs are typical of the larger amounts of work on canal lining, for the smaller reservoir jobs the costs will usually be somewhat higher, as the work cannot be as effectively organized.

Thickness of lining	Average Costs of Concrete Linings	
	From	To
1	2.75	3.50
1½	3.50	4.50
2	4.25	5.50
2½	5.10	6.50
3	6.00	7.50
4	7.50	9.50

The above discussion of the various methods of reducing seepage indicates that a clay or oil lining may be placed at costs of 1 cent per square foot, plaster linings for about 3 cents, and heavier concrete linings for about 6 cents per square foot. In a previous article the relative costs of earth reservoirs of different sizes and depths has been given. The effect of the cost of such linings on the total cost of reservoirs in terms of the capacity secured can be seen, if to the cost of the untreated reservoirs is added the cost of the lining for the prices given above. This is done for typical sizes in table 1. The lining is carried 6 inches above high water level and the banks six inches above the lining. The dimensions of the banks are the same as those given in the previous article, except that when lined with concrete the inner slope may be made steeper. For the clay puddle and oil linings or those estimated to cost 1 cent per square foot an inner slope of 2½ to 1 is used; for plaster linings this may be made 2 to 1; for heavier concrete linings 1½ to 1 can be used. The reservoirs are figured for balanced cut and fill, the material for the banks being excavated from the inside of the reservoir.

In Fig. 1 the cost per acre foot of capacity for different capacities is shown. The curves are for various depths and costs of lining. For the unit prices of construction used, these curves indicate that for lined reservoirs the greater depths are more economical. Where linings costing 1 cent per square foot are to be used the depths of 6 feet are cheaper. The difference between depths of 4 or 6 feet for any given capacity is not large, however. For clay or oil linings depths of 6 ft. would not be exceeded unless a material saving in cost would be made due to the greater danger of breaks with higher banks. If land is valued at more than \$100 per acre, the greater depths would be relatively cheaper, and a depth of 6 feet would be economical. For land valued at less than \$100 per acre, 4 or 5 foot depths, particularly for the smaller sizes, would be preferable.

Where linings costing 3 cents per square foot are used, the cost of the lining becomes relatively more important than the cost of the bank, and the greater depths are less expensive per unit of capacity. There is little saving for depths of over 7 feet, and for the

capacities shown a depth of 7 feet may be taken as the maximum desirable. The linings represented by a cost of 3 cents per square foot are plaster coatings of cement which do not have sufficient strength to enable light banks to be used, so that depths greater than 7 feet add to the danger of breaks. Depth of less than 4 feet are more expensive per unit of capacity even when no value is given to the land used.

For linings costing 6 cents per square foot the cost of the lining controls the total cost. The cost per unit of capacity decreases with increase in the depth to greater depths than with the cheaper linings. Where depths greater than 8 feet are used, the pressure on the outlet gates increases the difficulty of operation, and geared gates will be required for the larger sizes. Unless a material saving can be made in construction costs, depths of over 7 feet would not be desirable. Such linings are sufficiently strong to reduce the risk of breaking of the banks so that greater depths may be safely used than with the lighter linings.

The figures given are for reservoirs using excavation from the inside to make the fills. If ground at sufficiently high elevation cannot be secured to make this method practicable, the banks will have to be built entirely above the ground surface. This does not materially increase the cost for the reservoirs using the more expensive linings as the total cost consists mainly of that for the lining.

A comparison of the estimated cost of reservoirs of economic depth for different capacities for the different types is given in the following table:

Comparative Estimate Costs of Reservoirs

Capacity acre feet	Unlined earth	Cost per Acre Foot of Capacity		
		Lined at cost of 1c per sq. ft.	Lining cost. 3c per sq. ft.	Lining cost. 6c per sq. ft.
.5	\$160	\$300	\$480	\$750
1.0	130	250	420	670
2.0	110	210	360	590
4.0	80	180	310	510

This table shows the much lower costs which can be secured where lining is not required and indicates the reason why reservoirs are not generally used in localities where the soil is such as to require lining unless the cheaper forms of lining can be used or the value of water warrants the high cost of the better linings.

In addition to the questions of first cost the relative permanence of each type of lining must be considered. Oil linings in canals have not been as permanent as expected. They have not been in use in reservoirs sufficiently long to give data on their life in such linings. Clay puddle should have a relatively long useful life. Thin plaster linings will not be as permanent as those of greater thickness or those in which wire mesh or other reinforcing is used. Plaster linings on well settled banks free from frost action would be expected to last 10 years, heavier or reinforced linings 20 years. In some cases these figures may be exceeded, in others where linings are poorly built they may not be realized. The longer useful life of the more expensive linings make them relatively cheaper in cost of actual service than the figures of first cost would indicate. By balancing the value of water loss saved by a lining against the annual charge for interest and depreciation of the lining the relative economy of each type may be compared for any individual case. With water pumped through high lifts

where reservoirs are used 60 days per year, a reduction in seepage losses of 1 to 2 inches in depth per day may have a value in excess of the cost of lining.

The figures of cost given are for normal conditions of materials and labor and are based on results secured in the past. Under present war conditions it would be difficult to construct such reservoirs at the figures given if outside labor had to be employed.

NEW RADIO PLANT IN HAWAII MOST POWERFUL IN THE WORLD

The opening of the Navy's new high power radio station in the Hawaiian Islands is announced. This station is the most powerful radio station in the world and is designed for direct communication with Washington and the Philippines. Exchange of messages was carried out recently between the radio station, Sayville, Long Island, and the Honolulu station, a distance of approximately 5,000 miles. This is the world's record for long distance exchange of communication by radio, and marks a distinct advance in the radio art. The tests to date indicate that communication between Washington and the Philippines will easily be accomplished with but one relay through the Hawaiian station.

The Hawaiian station is one of a chain of high-power radio stations under construction by the Navy Department. The principal stations completed to date, in this chain, are Arlington, Darien (Canal Zone), and San Diego. The remainder of the stations, at Cavite (Philippines) Guam, and Tutuila will be completed during the next two months. The high-power stations consist of three masts at each station to support the aerial, each mast being steel self-supporting. The apparatus is of the Poulsen arc type, which is standard in stations of the high power chain. Suitable and comfortable quarters are provided for personnel at each station.

BEFORE ELECTRICITY

As a contrast to the news of the latest advance in the electrification of railroads, it is interesting to read a "Copy of the Rules for Travelers on the First Railway," a document still preserved among the archives of the company of the Manchester to Liverpool Railway.

1. Any person desiring to travel from Liverpool to Manchester, or vice versa, or any portion of the journey thereof, must, 24 hours beforehand, make application to the station agent at the place of departure, giving his name, address, place of birth, age, occupation and reason for desiring to travel.

2. The station agent upon assuring himself that the applicant desires to travel for a just and lawful cause, shall thereupon issue a ticket to the applicant, who shall travel by the train named thereon.

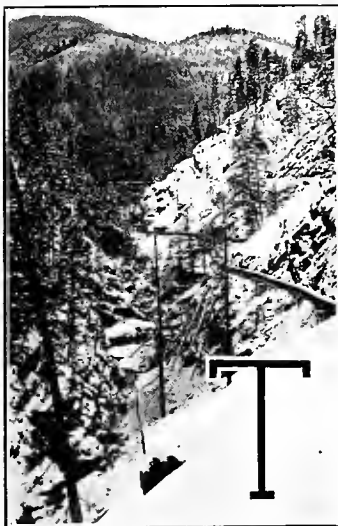
3. Trains will start at their point of departure as near schedule time as possible, but the company does not guarantee when they will reach their destination.

4. Trains not reaching their destination before dark will put up at one of the several stopping places along the route for the night, and passengers must pay and provide for their own lodging during the night.

5. Luggage will be carried on the roof of the carriages. If such luggage gets wet, the company will not be responsible for loss attaching thereto.

ELECTRICITY IN A MONTANA MINE

(Mountain snows in the winter and the great dust involved in the crushing processes in the summer offer the greatest problems in a mountain mine such as that of the Snowstorm Consolidated. Here is a mine which in spite of such difficulties is successfully operated by electricity throughout.—The Editor.)



Heavy snows in winter necessitate the protection of the flumes and railroad bed.

THE mill crusher, roughing tables, elevator, mills and hoist of the Snowstorm Consolidated Mines are now completely handled by electricity, and the company is further considering the adoption of electric storage battery locomotives and the installation of the electrolytic process for extracting the zinc from the ore.

The hydroelectric plant is located on Lake Creek above the falls, about 2 miles from Troy, Montana. From the dam the

water is conveyed by 2000 feet of flume to a 2100 h.p. Pelton-Francis Turbine connected with a 1250 kva., 6600-volt 3-phase General Electric generator which supplies the power for the mine. The mill substation, a mile and a quarter from the power plant, provides the necessary switches and transformers. The voltage is here lowered to 2300 for local distribution, all motors with but one exception being operated from the 2300-volt service.

An interesting problem is met with in the operation of the mill. Owing to the excessive amount of dust inherent in the processes of crushing and handling the ore, it has been found that induction motors of the squirrel cage type started by means of a compensator give less trouble to maintain. This type of motor, however, involves some difficulty in starting and it is necessary to make several attempts each time before the mill gets under way. By throwing the compensator handle to the starting position and releasing it quickly, the mill swings, however, and by catching it on the swing, the motor is enabled to bring the mill up to speed. As the mills run for weeks without stopping, no great inconvenience is experienced by this method of starting.

The mine itself is some 5 miles distant from the mill, being connected by the transmission line, a narrow gauge railway which winds about the mountain slopes far above Calahan Creek and the wooden flume which diverts the water from this creek three miles above the mill. Owing to the extremely mountainous character of the country, great difficulties in construction were met with at certain points. In the original building of the roadbed it was occasionally found necessary to let the first crew down from overhead by means of a rope and thus enable them to blast a way past the walls of the canyon. Winter snows and the consequent snow slides, rock slides, and falling trees constitute a further problem which must be met both in the case of the flume and the railway.

Practically every process in the handling of the ore is now electrically operated—and with the adoption of the electrolytic process of extracting the zinc, the round will be practically complete.



THE CONCENTRATOR PLANT



THE LAKE CREEK FLUME

From the dam above the falls, the water is conveyed by flume to a 60 inch penstock, thence to the turbine and generator. The mill substation is about a mile and a quarter from the power plant.

SHORT JOURNEYS IN PACIFIC LANDS

(The question of where to stop in the orient is one which always concerns the prospective traveler, but it proves to be a problem easily solved. South America still presents greater difficulties in accommodations and traveling facilities, but the engineering traveler usually finds a way out.—The Editor.)

THE HOTELS OF JAPAN The Oriental Hotel at Kobe



Electrical methods have not yet been adopted by all of the industries of Japan

THE Oriental Hotel at Kobe, Japan, like the Grand Hotel at Yokohama, is located along the "bund" or water front. Kobe is the greatest shipping port of Japan and exceeds even Yokohama, although to many the latter city, due to its close connection with Tokyo, is of far more interest. The har-

bor of Kobe is not by any means so picturesque as that of Yokohama. On the other hand, the near situation of the hills immediately in its rear give Kobe a distinct charm not possessed by the latter city. The appointments of this hotel are strictly first class and quite similar to those of the Grand at Yokohama.

At Nagasaki the Belle-Vue is Interesting and Unique

At Nagasaki, the great coaling port of Japan, the principle hotel is the Belle-Vue. Its surroundings are quite different from the two former hostelrys just described. It approaches the Japanese in arrangement and departs materially from the European or American methods. Situated among beautiful foliage with a view of the nearby water front, the hotel has a distinct charm that one would enjoy if forced to stay in the interesting but secluded port of Nagasaki.

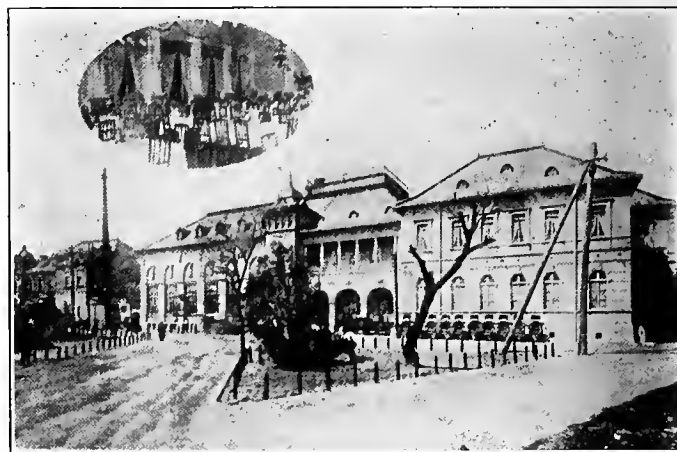
Returning again through Japan, one may go overland to Tokyo, in which case information relative to the leading hostelry of the Imperial city as well as those of Osaka and Kyoto will be useful.

The Osaka Hotel, the Metropolis of Japan's Industrial Life

Osaka is the great manufacturing center of Japan, and is located about a half hour's journey by rail from Kobe. As one approaches the outskirts of this great metropolis, the second largest in Japan, the smoke from a hundred huge chimneys rising in the distance brings to the imagination the great manufacturing and industrial cities of America—Pittsburg, and the like.

Met at the depot by enterprising, alert red cap boys, one is forcefully reminded that the red cap negro porter of America would certainly have to awaken before he could be placed in the same class with these men. But a few minutes elapse before one arrives by rickshaw at the Osaka Hotel. The structure is a substantial, businesslike edifice, with little to attract the interest of the foreigner, except that here is to be found the best cuisine of any hotel in Japan. The edibles are all planned and prepared

under the direction of a French chef. Though all courses travel under French names they are all free from the spice and heavy seasoning so often encountered in one's travels. There is little to interest the tourist, but much for one interested in the industrial development of a great nation. No dansants



THE OSAKA HOTEL

This well-built hostelry of Osaka, Japan, is in full keeping in design and construction with the industrial life and enterprise of this, Japan's greatest industrial center. There are few things in its appointments to interest the tourist but the man on business bent finds everything needful for his comfort and convenience.

were under way during our stay, but instead banquets of business men eager to extend trade and heighten business relations were constantly being held at the hotel. Thus is reflected as a rule upon the principal hostelry the life and ambitions of the metropolis itself.

DOING BUSINESS IN GUATEMALA

BY J. W. FINCH

The trip through the mountains and down the western slope to Escuintla at the base, is one which affords some truly beautiful scenery and at points along the line there are magnificent vistas of the gently sloping, nearly flat lowlands, with the majestic Pacific Ocean in the far distance. These lowlands of the west are developed to a greater extent than the eastern part of the Republic. The largest and most productive coffee "fincas" being here, as well as lands upon which are cultivated wheat, barley, corn, beans, sugar, rubber, cocoa, fruits and fibers. Mahogany grows abundantly and is so plentiful that it is used for railroad ties. Cattle is also raised on a quite extensive scale.

Escuintla is the first town of importance on our trip and lies at a considerable lower altitude than the capital. The Gran Hotel Ferrocarril here is, in common with nearly all other native hotels I have encountered, an almost impossible place to stop. After getting into the lightest of Palm Beach clothes, for here the heat is intense, we are ready to look around the town and we find it is small and can be worked

in a day if no time is lost. There are three or four merchants here who import directly from the United States, although not in large quantities. Here are also located store rooms of the railroad company. We are glad to leave Escuintla for Mazatenango, the next town, as we feel sure the accommodations cannot be worse. There are other small villages on the way but none of them supporting anything excepting small native stores.

Leaving Escuintla, the right of way passes through truly tropical country, the track being lined



ELECTRICITY NEEDED

Transportation facilities in Guatemala might easily be improved by the introduction of electric railways. These bullock carts are seen commonly in the city as well as in the country.

on both sides with trees and plants of many varieties. Every way we look and as far as we can see, are green things growing; bananas, cocoanuts and pineapples line the right of way. Immense bread fruit trees, mangoes, mamays and aguacates are seen in abundant profusion. It is afternoon and raining, as it does every afternoon at this season (June). Seldom, if ever, will it rain in the morning, but it is not safe to go a great distance from cover in the afternoon without a rubber poncho, or other adequate waterproof protection. A rain storm comes upon you without warning and unless you have experienced one you can have no conception of the amount of water that can fall from the heavens in the space of a minute. Well, the average rainfall per season from May to October, in the "Occidente" is 200 inches more or less. If you happened to be caught in the open some afternoon you would think this amount was a week's average instead of a season's.

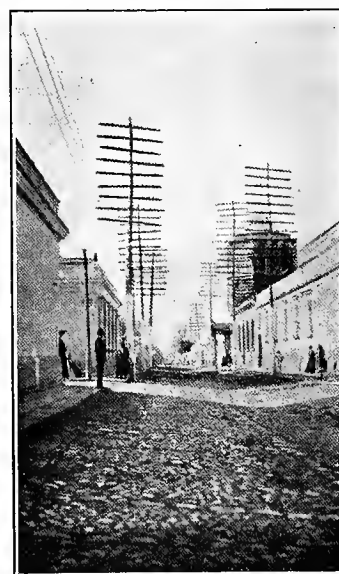
The road to Quezaltenango is well defined, but nevertheless we have a mozo who accompanies us on foot to direct the way. He easily keeps up with the mules who have a sort of pacing gait and are really not uncomfortable until you have been in the saddle for a few hours. We make the start at six o'clock in the morning and immediately commence climbing, as Quezaltenango is 7335 ft. in elevation and we cross the summit of the mountains at about 9000 ft. We encounter on the road during the day probably not less than five or six hundred mozos with their women and children, all of them carrying something, even to the child of six or seven. All freight, excepting the largest and heaviest pieces is carried into Quezaltenango on the backs of these native Indians. We encountered a group of probably thirty mozos with Singer sewing

machines on their backs, another group with cases of petroleum, another with flour, still others carrying bananas, melons and vegetables, these latter coming from the fincas or some small farmer's little patch of land, to the market. The road in places is almost impassable and we wonder how an automobile can negotiate it. After six weary hours in the saddle, continually climbing, climbing, climbing, we reach the little Indian village of Zunil at the base of the Santa Maria volcano, which a few years ago erupted violently, covering the surrounding country with ashes and causing considerable property damage. We have crossed the volcano well up on its side and one section of the road passes close to steaming fissures in the mountain side, while a boiling geyser is seen a little way below us, shooting a stream of water high into the air. The entire mountain slope is enveloped in a bank of steam and it makes us wonder and marvel at the works of nature.

Before leaving San Felipe we have changed again to our heavier clothing but as we pass through another and smaller Indian village, Almolongo, and approach Quezaltenango, which is just across the hill, we almost wish we had overcoats. The air is fresh and crisp until we get into the city. The air is still crisp but if you have ever been in a Latin American town you will know that it is far from fresh. You soon become accustomed to these things in the tropics. Quezaltenango is an old city and is the capital of the department of the same name. It has its plaza, without which no Latin American city or town is complete, a municipal palace, an armory, a municipal theater, a bank and a half dozen more or less import houses. It is the distributing point for a large but not very thickly populated section.

After a stay of a few days here we return to San Felipe, making the journey this time in the diligencia. The automobile had made the trip the day before, but we were not finished with our business so the next day we had to choose one of two evils. We chose the diligencia but never again. At least if you ride a mule you can miss some of the boulders and holes and you don't have to hold on for your life for a solid eight hour stretch. Besides you have a seat wider than six inches. My advice is to choose the mule every time.

When we return to San Felipe we find our trunk, which has been despatched by a guaranteed-to-be-trustworthy mozo, awaiting us. The trunk is on time but minus its straps and ropes. We don't mind this as we are used to such things here and consider it all a part of the day's work.



The Guatemalan streets have at least the telegraph poles in common with home

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(One of the most difficult problems in the fixing of rates lies in the establishing of values for reservoir properties held. Do such lands hold a value peculiar to themselves or are they to be judged upon the same basis as other real estate? Questions of the elements involved in such valuation are here considered by an eminent writer and authority on this subject.—The Editor.)

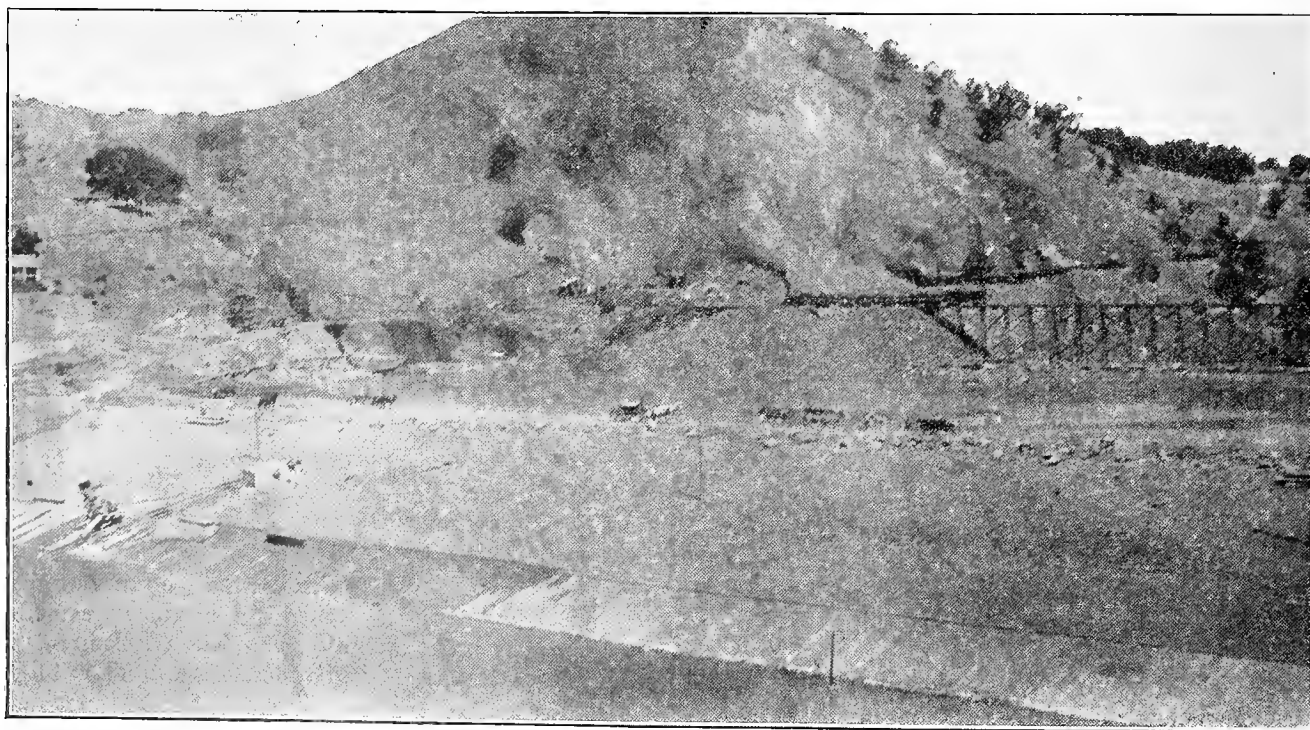
THE VALUATION OF RESERVOIR LANDS IN THE SAN FRANCISCO BAY REGION

No definite solution of the problem how to determine the value of reservoir property has yet been devised. There is, in fact, no recognized rule by which the market value of any property which has peculiar adaptability for some particular use can be determined. No other course is open in ascertaining the value of such property than to determine the effect upon the market of a knowledge of all the circumstances bearing upon each case.

Speaking generally of the value of real estate, it may be said that the effect of all factors which influence its market value is reflected in the valuations made from time to time by experts, and by the courts or other public authority, and also by the sales of which knowledge is obtainable. The essential element of rental value or productiveness will be presently referred to. As the previous valuations and records of sales of similar property do not apply to the time at which the valuation is being made, some attention must be given to the rate at which the value of real estate, expressed in terms of money, has been advancing. For the region on both sides of the south arm of San Francisco Bay such a study has been made and the results thereof are hereinafter presented. This study has been extended to five of the bay counties and to the entire State of California and covers not alone the rates at which real estate values have been increasing but also the rate of population growth.

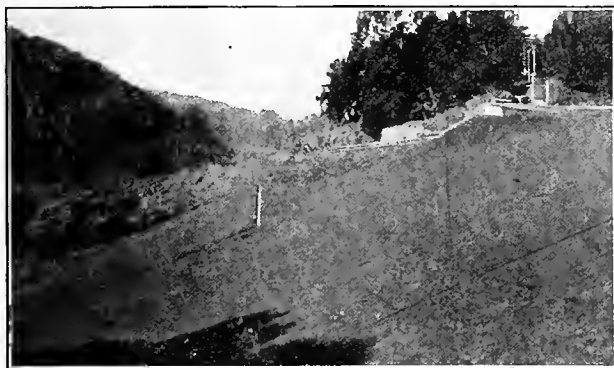
As population increases the uses to which land can be put with profit are advanced from lower to higher uses. The value of land will go up as the demand for its higher use becomes more insistent. If any tract of land taken at random be considered, its value will go up in some relation to the increasing density of population in its vicinity. The more remote that it is from a population center and the smaller the demand of society that it be put to beneficial use, the more difficult will it usually be to trace the effect of the growth of population on its value. For a time the supply of land on the frontier is so large that the value thereof may not be determinable from the return that can be realized by using it in any particular way. But even in the case of the frontier land it will be found that as the demand of society for the beneficial use thereof increases its value will increase. When the time can be forecast with some degree of certainty, at which the land will be in demand for any particular use, the basis for estimating value begins to assume definiteness. When finally, under use for certain purposes, the land can be depended upon to produce income, the basis of its value, in part at least, becomes positive. It may, nevertheless, still continue to have more or less speculative value due to its proximate requirement for higher uses.

Ordinarily when the value of land is in question, the return which the land produces in rents or otherwise, or the return which it may reasonably be hoped to realize in the future, as also the sales of other sim-



Calaveras Valley, showing reservoir site

ilarly located property adapted to similar uses can be used as guides to a determination of market value. The actual sales are valuable, if there have been any, because they furnish more or less dependable evidence of the effect of all known circumstances upon the public mind in the matter of land value. But when land is under consideration which is in use or which is available for use as a storage reservoir there is usually no such index of market value which can be applied. It would be an unusual circumstance to



San Leandro Dam

find sales of recent date of similar property that would with any definiteness demonstrate the market value. Neither is the rental value of such property for the reservoir use to which it is specially suited, ascertainable, even when already in use, because actual competitive demand for such property is usually out of the question and it is not practicable to so apportion the net return of the water supply business that the amount thereof which should be ascribed to the use of the reservoir lands and which might be a key to rental value can be ascertained.

There are, nevertheless, many circumstances which, when properly understood, will have an effect upon the market value of reservoir properties. Such, for example, are the time when the use of the reservoir site in question will be a necessity, and the time when the water supply commanded and made available by the reservoir will be in full use; also the existence and relative availability of other storage sites or other sources of water; the location of the reservoir site and all circumstances affecting the cost of developing the storage and of developing the water, particularly when the reservoir site is not yet in use nor immediately requisite; also the extent to which the availability of any particular site has been demonstrated by the actual construction of works and the impounding of water; the quality of the water, and every circumstance relating to valuations theretofore made by competent authority of the property in question or of other like properties, whether for rate-fixing or other purposes.

Consideration should therefore be given:

- To the adaptability of the site for use as a reservoir.
- To the necessity for such use immediately or in the near future and to the continuance of such use.
- To the fact that the reservoir lands have been assembled in one holding.
- To the question of whether or not the serviceability of the reservoir site for water storage has been demonstrated by actual use.

To the cost of the lands and their increase in value since the time of purchase.

To the valuations of these and other reservoir lands heretofore determined or ascertained by rate fixing authorities and by the courts.

To the service rendered or to be rendered in the matter of the amount and quality of the water and the advantages or disadvantages of the location of the reservoir site, particularly when one of the functions of the reservoir is to safeguard a supply.

None of these factors taken separately leads to a determination of value which could be accepted without question. Any or all of them may influence a willing seller or a prudent purchaser in determining the sale or purchase price of such properties and they all, therefore, must be regarded as having more or less effect upon market value.

Any evidence furnished by sales of similar property should be carefully examined and should not be too heavily weighted. In the case of any individual sale there may have been lack of information on the part of the seller of the full market value of the land or the sale may have been prompted by other considerations than the price obtained for it. Consequently but little dependence can ordinarily be placed on any single real estate transaction.

It is the multiplication of these transactions which makes them, presumptively at least, an index of the judgment of the public relating to market value. The fewer the number of transactions and the greater the uncertainty relating to the circumstances in each thereof, the less dependable will any such index necessarily be.

The elements which determine the utility of a reservoir area for the development of a water supply by storage are in the main:

1. A fairly level area of considerable extent enclosed or nearly enclosed by higher land, forming a basin which may have an outlet and possibly in addition one or more low places or secondary outlets in the surrounding rim land, all of which can be closed by dams.
2. A tributary watershed from which the run-off due to snow and rainfall is sufficient to be worth while, after allowing for evaporation and other water losses from the reservoir.



San Pablo Dam

3. A geologic formation such that the construction of the necessary dam or dams is feasible and water losses from the reservoir will not be excessive.

4. A location and topographic configuration such that the cost of structures will not be prohibitive.

5. A market, present, or prospective, for the water supply which will be made available.

In the case of a storage reservoir the prime purpose of which is to hold a supply of water in reserve, for emergency use, and whose serviceability as a producer of water is secondary, an element of first importance in determining its utility will be location in reference to the district to be served and in relation to the other works for the supply of the district.

The function of the storage reservoir, broadly stated, is to bring the natural flow of the stream which feeds it under control, so as to make better utilization possible and to reduce waste. Without a storage reservoir the limit of utilization at any particular time is the discharge of the stream at that time. In the vicinity of San Francisco stream flow fluctuates within wide limits. Under the peculiar climatic conditions of the Pacific Coast the stream which flashes up to a large discharge and flood stages, under the influence of the winter rain storms, may dwindle to insignificance in the long dry period of summer or in the interval between the intermittent rains of the winter months. As a source of water for use in supplying the needs of the inhabitants of a city, such streams as those controlled by reservoirs in the San Francisco bay region would be of but little value without storage reservoirs. Nevertheless, in any strict analysis of the service rendered by a reservoir in increasing the water supply from the stream which feeds it, some account should be taken of the additional amount of water (that is of the water in excess of that obtainable from the stream in its natural condition) which the reservoir makes available. Under California conditions, in the Coast Range and in the lower portions of the Sierra Nevada this is frequently the entire possible water output, because without storage the obtainable dependable continuous supply measured by the minimum natural flow would not justify utilization.

It is, of course, different when water is required intermittently and in coincidence, or nearly so, with the natural large flow in the stream as may be the case when water is used for irrigation. Thus, for example, a large part of the snow which falls during the winter months in the high Sierra Nevada Mountains, melts and appears in the stream in the spring and early summer months at the very time when water is in demand for irrigation. When, on a stream which carries this water, storage is provided, there will be better control of the flow, wastage will be reduced, and water may be held over from a season of abundant run-off to another in which the natural flow is light, but the condition will rarely prevail under which the storage reservoir could be given credit for the entire amount of irrigation water developed and withdrawn from the stream.

The utility of the reservoir in such a case is measured by the improved service which it makes possible and by the reduction in the amount of water that without the reservoir would go to waste.

In view of the conditions as they prevail in the San Francisco Bay region the comparison of storage reservoirs here, whose water is used to supply the needs of the residents of cities, can best be made on the basis of the water output or yield per acre of ground covered by the reservoir. But in addition,

other factors, such as the amount of storage per acre of reservoir, and the location of the reservoir may also require attention and, of course, too, the suitability of the water for the uses to which it is to be applied.

Attention may be called in this connection to the fact that there may be reservoirs of so large an extent that their value per acre of reservoir surface is small. The case of a lake may readily be conceived which has a large surface area and which with a low, perhaps inexpensive dam, will store a large amount of water. From such a reservoir the loss of water by evaporation will be relatively large and it may well be that the water production will now and then be negative, that is, there will be occasional years with less inflow into the lake than is required to make good the evaporation. As an extreme example of this kind, Goose Lake, in the northeasterly corner of California may be cited. For more than a half century there has been no outflow from this lake. As a storage basin in the ordinary sense this lake would have no value. Tulare Lake is another example. Occasionally in such seasons as 1861-62 and 1867-68 the lake has been full and during a series of years when at or near a full stage, has contributed to the flow of San Joaquin River. But some forty years have now elapsed since there has been any outflow from the lake. The evaporation from the large area that is exposed to evaporation when there is water in the lake offsets the inflow in ordinary years.

To make the lake a dependable source of water provision must be made to draw down its water to lower levels, thereby reducing the water surface area and decreasing the annual evaporation.

Other examples can be cited of lakes which are of so large an extent that their value as storage basins is low when compared with other reservoirs of the same storage capacity but of less surface extent.

There may be instances, too, though in the case of storage reservoirs they appear as exceptions rather than as the rule, where the superior function of the reservoir is to hold water in reserve to be available in case of accident to the system as ordinarily in use. Under such circumstances the value of the reservoir may not depend upon its water production but rather upon its location and storage capacity. A case in point is Merced Lake, located within the limits of San Francisco, which rendered such valuable aid as an ample emergency source of water in 1906, during the time that, as the result of the earthquake and fire, the main lines of San Francisco's water supply were temporarily out of commission. Water from this lake is in use in small quantity, about 3,000,000 gallons per day. It is expected that this use will cease in the near future when an additional supply of water is brought across the Bay from the Alameda and Calaveras Creek systems. As an emergency source of water the lake will thereafter continue to have value, but this value can not be brought into any satisfactory relation with the value of other more remote storage sites on the basis of water production or utilization which for Lake Merced may soon be so small as to be negligible.

Such factors as these are among those to be considered when the water production from reservoirs or the value of reservoir land is to be determined.

WOMEN IN THE INDUSTRY

(The European countries are coming to the point where they are providing definite special technical training for the women who have entered the industrial field. The Y. W. C. A. is the only organization in America which has taken public measures to meet the war situation in this respect. Not only have they cared for special war conditions near camps and munition plants, but they are helping to train workers where needed and to maintain the spirit of those now employed. Their special national drive for four million dollars which starts on December 3rd deserves your support.—The Editor.)

THE Y. W. C. A. IN YOUR INDUSTRY

Besides the extensive special war work which the Y. W. C. A. is carrying on in the regions adjacent to National Army Camps, they have realized that part of the need of the national crisis consists in the avoidance of just such problems as strikes and dissatisfaction among women workers in the trades and industries. With the idea of making every girl in the United States feel that her service in industry or in the home was a patriotic one, they have fostered the work of the Patriotic League under the direct supervision of the Junior War Work Council.

All girls are eligible irrespective of race, religion or occupation. Any body of employees or group of girls may adopt the work of the League without in any way giving up their entity or special work. An idea of the nature of the league is to be gained from its pledge:

Pledge of the Patriotic League

I pledge to express my patriotism
By doing better than ever before whatever work I have to do;
By rendering whatever special service I can to my community and country;
By living up to the highest standards of character and honor and helping others to do the same.

Signed, _____



In the work that they are now doing, the girls are urged to stick to the job that they are trained to do; to get the most out of every hour. They are urged to handle tools carefully and care for them in such a way that they may give their best service, to make their work just as perfect as they can make it.

INDUSTRIAL WOMEN IN FRANCE

One of the great sociological problems with which France will have to deal after the war will be the industrial status of women. Since the beginning of the war female labor has largely supplied the shortage caused by the mobilization of the men. Many of them have taken complete charge of important business interests; they are employed in banks and in technical institutions; factories and plants requiring great numbers of unskilled workers have found an ample supply among the women; they act as letter carriers, telegraph messengers, and street car, truck, and carriage drivers. The general consensus of opinion is that they

have "made good," and that they have established for themselves a permanent place in the industrial and commercial life of France.

Training School for Women Workers

It remained for the mayor of Lyon, Mr. Edouard Herriot, to take the first effective step in providing a professional training school for the higher technical development of women. This school will open its first session on October 1, 1917, and its curriculum will include a commercial course and a technical course of two years each.

The full program of studies for the commercial course includes commercial, industrial, and labor legislation; industrial property; patents; foreign commercial questions, including transportation, storage, exchange, banking operations, etc.; commercial and industrial mathematics, including discounts, values, bills of lading, coinage, and annuities; knowledge of manufactured products of France; political economy; stenography and typewriting; and foreign languages. The course of training for draftswomen and technical secretaries includes industrial design, mathematics, and its higher branches, theory and application of mechanics, technical and machine shop work, theory and application of electricity, and foreign languages.

ELECTRICAL TERMS ILLUSTRATED—II.

If you do employ a woman —



DID IT EVER
OCCUR TO
YOU THAT:

THE field of window decorating is one that may well be handled by women. The artistic appeal, the advertising and business getting, even such ingenious electric wiring as may be needed are all within her grasp—indeed, women are making a success of this very field. Perhaps the most successful decorator of department store windows in the United States is a woman. One woman is 'consulting decorator' for a series of small stores. If your business is not large enough to need a decorator for your store alone—why not combine, a group of you in different parts of town, and hire one between you?

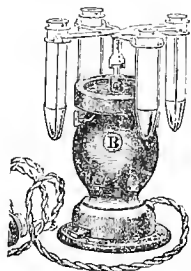
FUEL OIL AND STEAM ENGINEERING

BY ROBERT SIBLEY AND CHAS. H. DELANY

(Moisture in oil directly affects the commercial value of this product to such an extent that its accurate determination is a matter of great economic value. Here is a resume of all the more important methods employed in commercial practice to ascertain this factor. The discussion concludes with a detailed description of the distillation method for determination of the moisture content in which a numerical example is carried through to a conclusion.—The Editor.)

MOISTURE CONTENT OF OILS

From our previous discussion of steam generation in the modern central station it was found that something over a thousand heat units are necessary to convert water at ordinary temperatures into saturated steam. When moisture appears in the oil used for heat generating purposes in the furnace it is evident, then, that large heat losses may thereby be involved. For, not only must this moisture be converted into saturated steam, but this steam itself must be superheated to the temperature of the outgoing chimney gases, thus dissipating energies that should go toward steam generation in the boiler.



AN ELECTRICALLY DRIVEN OIL CENTRIFUGE

In this Centrifuge the four arms—two plain and two graduated—are caused to rotate by electric power and the water thus caused to separate from the oil. The consequent measurement of the moisture present is then easily ascertained.

Hence the water involved in fuel oil composition is a dead loss which should be avoided as far as possible. Settling tanks accomplish much in drawing off the water content, but when the water appears in the oil as an emulsion it is almost impossible to commercially segregate it from the oil. Since, then, all fuel oils contain a certain amount of moisture, the careful determination of its exact proportions often becomes an important problem in efficient steam engineering performance.

Summary of Methods Employed in Determining the Moisture Content.—There are ten methods by which the moisture content of oil can be ascertained with approximate accuracy. For detailed information on this subject the reader is referred to Technical Paper No. 25 of the United States Bureau of Mines entitled, "Methods for the Determination of Water in Petroleum and its Products." These methods may be briefly summarized as follows:

The moisture content of heavy oils and greases may be approximately ascertained by the loss of weight due to heating.

The moisture content of oil may be approximately obtained by diluting a sample with a sulphate and then causing separation by action of gravity. A diluent is to be avoided in this process, as inaccuracies are liable to be introduced.

Again by diluting with a solvent and separating the moisture content by means of a centrifuge, the moisture content is determined with a slightly greater degree of accuracy than by either of the above methods.

By treating a sample with calcium carbide, another convenient method is also arrived at, and its accuracy is approximately within 3% of the water percentage if care is observed. The sample, too, may be treated with sodium and a convenient and accurate method results.

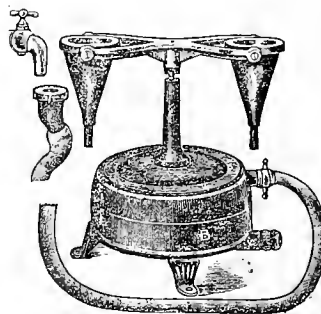
A color comparator is sometimes used, but the method is only approximate, as is also the method of treating a sample with normal acids. The electrical treatment, on the other hand, is successful in breaking up an emulsion on a commercial scale, or reducing the water content of an oil to such a condition that it may be successfully treated in some other manner. An emulsion is a physical condition of the oil and water wherein the water is held in such intimate contact with the oil ingredients as not to be readily separated by gravity or other ordinary means.

Again, too, distilling a sample mixed with a non-miscible liquid proves accurate to .033 grams of water per 100 cc. of benzine and oil in the distillate.

The most reliable method, however, is that accomplished by directly distilling off the water. This method is convenient and accurate to about .003 grams of water in the distillate, if the water is cooled to about 35° F.

The Approximate Method of Treatment.—The method hinted at above wherein the sample is treated by a foreign agent will now be briefly set forth, since such a preliminary determination often proves sufficiently accurate for the issues involved.

The method here outlined is especially applicable for the lighter oils. A burette graduated into 200 divisions is filled to the 100 mark with gasoline, and the remaining 100 divisions with the oil, which should be slightly warmed before mixing. The two are then shaken together and any shrinkage below the 200 mark filled up with the oil. The mixture should then be allowed to stand in a warm place for 24 hours, during which the water and silt will settle to the bottom. Their percentage by volume can then be

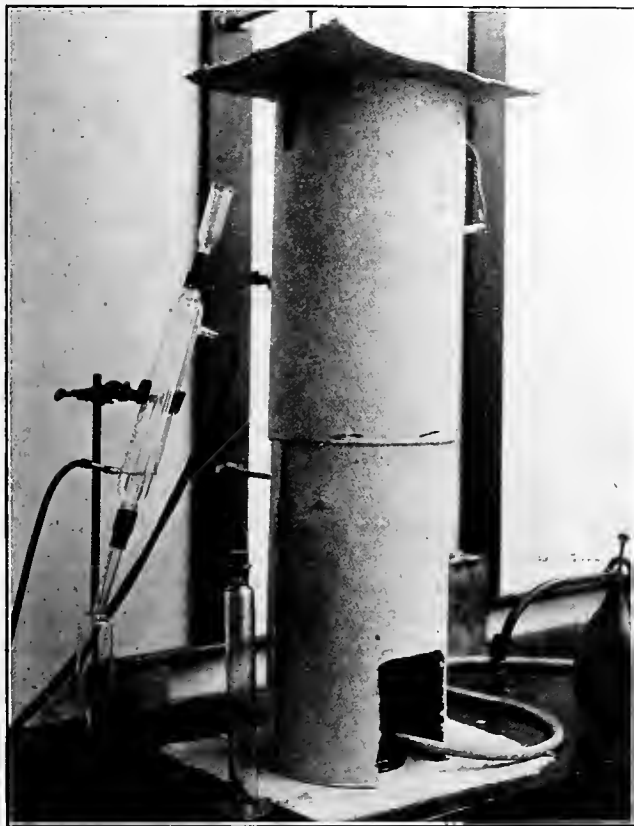


A GOETZ ATTACHMENT FOR WATER DETERMINATION

By attaching the pipe shown in the lower part of the figure to a faucet, sufficient power is obtained from the city main to cause the rapid rotation of the two arms shown in the figure. This high rotative speed, due to the centrifugal force developed, causes the separation of the moisture from the oil.

correctly read on the burette divisions, and the percentage by weight calculated from the specific gravities.

Details Involved in Determination by Distillation. Since the method of determination by distillation is to be recommended above all others, we shall now proceed to the details of its accomplishment. Stated in simple words, the method consists in heating a sample slightly above the boiling point of water but



STILL WITH HOOD USED FOR WATER DETERMINATION

Many methods are utilized in determining the water content of oil. The simplest and most accurate method for fuel oil tests is that of distillation. In this method a sample of the oil is poured into a still and raised sufficiently in temperature to evaporate the water and not the ingredients of the oil. By condensing the moisture and ascertaining its proportions the moisture content is easily ascertained.

not so high as to cause the vaporizing of other ingredients of the oil. As a consequence the water passes over and leaves water-free oil in the sample.

The Apparatus Involved and Preliminary Proceedings.—To quantitatively determine the moisture content the sample is placed in a copper vessel known as a still, which is about 4 in. in diameter and 6 in. high. The still is then placed in an asbestos hood through which a projecting stem connects to a condenser and a burette where the condensate is measured in a graduated tube. The can from which the sample is to be drawn is first immersed in a water bath with its cover released. After the water constituting the bath has been raised to a temperature of 150° to 170° F., the cover to the can is fastened tightly, and the can agitated for several minutes in order that any water that may have settled at the bottom may be thoroughly mixed with the oil. For successful agitation the sample can should not be filled more than two-thirds with oil. 100 c.c. of oil sample, measured in a graduated jar, are now poured into the still. The exact measurement of the oil is

difficult without experience, as froth collects on the surface of the oil and tends to obscure any definite meniscus.

The jar is next washed with 50 cc. of benzol and 50 cc. of toluene. The washings are poured into the still. Since toluene has a tendency to absorb small quantities of water, accurate results may be interfered with if the toluene is not previously saturated. In order to avoid such a possibility when opening a fresh bottle, 5 to 10 cc. of water should be added. The presence of water in the bottom of the bottle shows that the toluene is saturated, but care must be taken not to pour this water into the still when washing with the toluene.

The still must be gently shaken without splashing in order that its contents may be well mixed, and then placed in the asbestos hood and connected with the condenser. A hood and cover are provided, as shown in the illustration, to surround the still with a blanket of air at a uniform temperature. The still is then heated gradually to a temperature of about 300° F., which is usually accomplished after about fifteen minutes of heating. Since the boiling point of water has been now exceeded, the moisture in the sample begins to pass over into the condenser, and after the lapse of another fifteen minute period the distillation is complete. A thermometer for temperature control is seen at the right side of the asbestos hood in the illustration.

The Process of Distillation.—The process of distillation is interesting. At about 176° F. the benzol first passes over. This wets the condenser tube so that the moisture which is soon to follow will not readily cling to the tube but the more easily pass down into the measuring burette. The toluene follows at 230° F., and carries down with it any water which happens to remain in the condenser tube. The toluene does not, however, pass over in its entirety, since usually from 15 to 20 cc. remain in the still with the oil. In order to make up this deficiency in toluene about 15 cc. are poured down the condenser tube to free any small drops of water that may persist in remaining. This, however, does not affect the accuracy of the work, since the water content is finally separated by filtration and the water content thus obtained is alone measured.

The still while at a high temperature is drained, and, as its contents are now entirely free from water, it may be used again without additional cleaning.

Any small drops of water that cling to the side of the graduated measuring tubes must be released by a short wire. If now the resultant water is read in cc. the percentage of water by volume in the oil is easily obtained, since the water is separated from the mixture of benzol and toluene in the filter bottle.

A Numerical Determination.—Let us then follow this process by means of an illustrative example. Let us assume that 100 cc. of oil have been drawn as a sample, that 100 cc. of benzol and toluene have been poured with it into the still, and that the resultant distillate shows .484 cc. of water. It then follows directly that the percentage of water by volume is .484.

Error in Assuming Percentage by Weight is Same as Percentage by Volume.—The percentage of water by weight is not exactly equal to its percentage by volume, but may be taken equal to it for all practical purposes of boiler testing. This error is then nominal except with very light oils or any oil with considerable moisture content. Thus, if an oil sample of 100 cc. contains .50 cc. of water at 60° F., it will weigh $.484 \times .099 = .4835$ gm.

The percentage of water by weight is, therefore,4835
..... .9673

which equals .50%. The factor, .9673, appearing in the above, is the specific gravity of the oil sample at 60° F. This was ascertained by means of a Westphal balance, which is shown in detail in the preceding chapter.

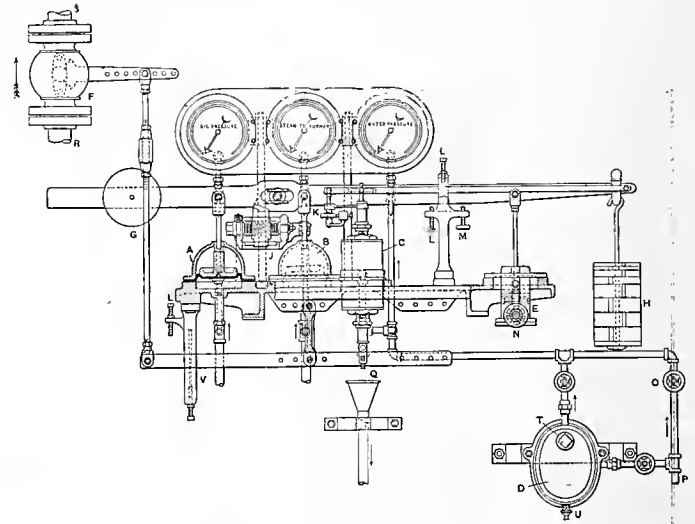
A NEW SYSTEM OF FUEL OIL REGULATION

An interesting detail in the boiler plant is the automatic system of firing employed to minimize labor and improve efficiency in burning the oil. The Moore patent fuel oil regulating system which, from one central point, controls the oil supply, the atomizing steam and the amount of air to each furnace, is an interesting example.

This regulator is actuated by the pressure from the main steam header so that any variation in steam requirements will cause a corresponding change in the amount of oil fired, due to an increase or decrease in the steam supply to the oil pumps and atomizers. Any fluctuation in steam pressure operates a governor whose power arm controls a bleeder valve on the oil pump discharge line, thus cutting off the oil supply

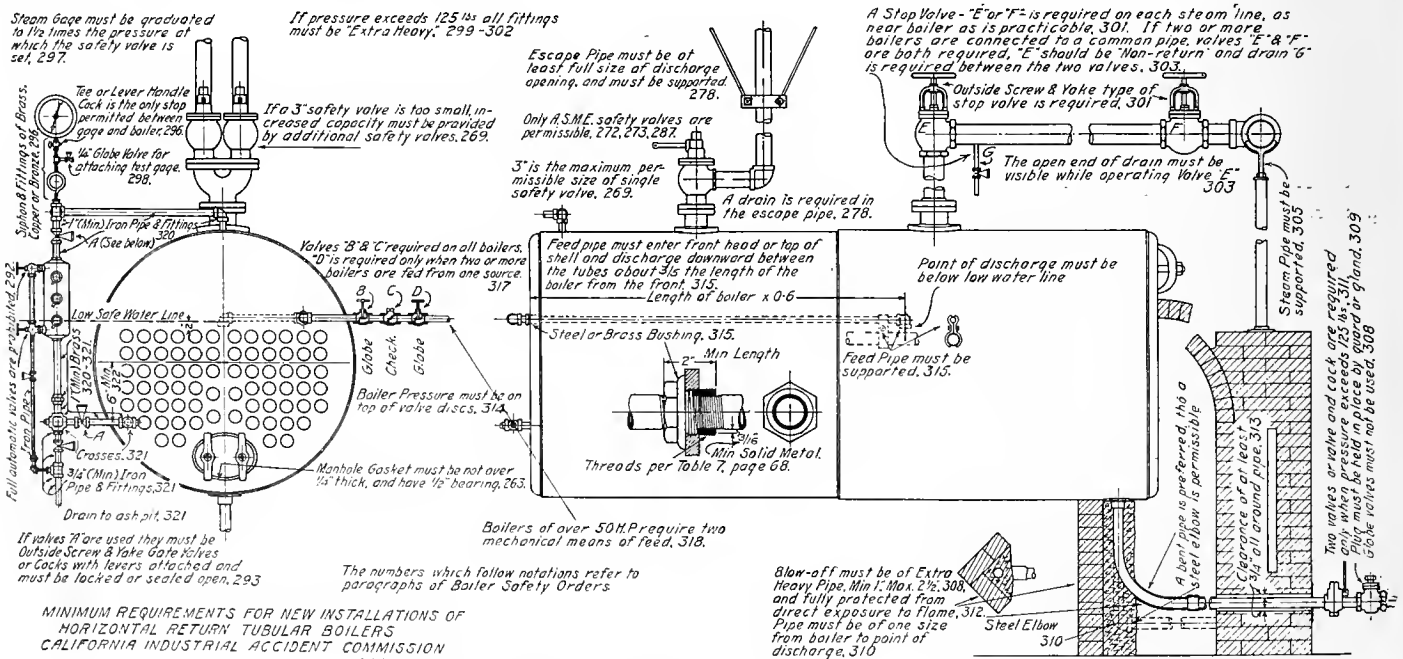
if the steam pressure is too high and reducing it if too low. Any change in pressure in the oil main, in turn, controls the amount of steam for atomizing and of air for burning the oil.

It is found that a simple straight line relationship exists between the amount of steam required for atom-



Steam to Burner Regulator

izing the oil and the amount of oil burned. Two diaphragms are employed to balance the pressures in the oil main and in the steam main connected to the burners, these pressures in this instance being 200 lb. and 80 lb. respectively. Any difference in oil pressure operates a rotary chronometer valve in the steam main through the medium of a fulcrum, water motor and lever connecting rod. Likewise the variance in oil pressure actuates a counterweighted rock shaft which moves the dampers so as to vary the amount of air admitted for combustion.



SUGGESTIONS FOR SAFETY IN BOILER INSTALLATION

Helpful Suggestions for Safety in Boiler Installation have been put into concrete form by the California Industrial Accident Commission. Here is a reproduction of a drawing which has recently been made up to serve as a guide in the installation of boilers. Additional copies of this cut will be furnished to any one who is sufficiently interested in the subject to make application for them to the Safety Department of the Commission.

AN EMPLOYMENT SERVICE

There is no question but that the employment situation is a serious one. There is hardly a man in the electrical business who has not lost at least one employee through the war. The service records of some of our large establishments with their three and four hundred men in the National Army are truly imposing. The withdrawal of these thousands of employees has been met as best the labor situation permitted, but there are still many concerns which are short handed and many which are limping along with more or less unsatisfactory help temporarily handling the situation.

An echo of this need has been heard from time to time in the offices of the Journal of Electricity and with the material at hand, an attempt has been made to meet the situation. Wherever possible recommendations have been made, positions filled or found. The Journal believes that the time has come when

cent of a year's; even non-commercial agencies elsewhere charge 3 and 6 per cent respectively. The Journal of Electricity wishes to donate this service free to its subscribers in the patriotic desire to meet a present need. If you need a man or a woman or if you yourself are in need of a position, the only question which will be asked of you is: "Are you a paid subscriber of the Journal of Electricity?" If so, the Service Department is at your service.

In addition to this offer through the columns of the Journal of Electricity, the Journal is in constant touch with the great universities of the West and with the membership of the many electrical societies and clubs who might furnish the men to fill the desired position, and an endeavor will be made to locate such prospects. Besides this work with the men, a considerable list of trained women has already been made out, many of them with experience back of them, some with university training, all ready to fill positions from office work to substituting in technical positions.

The present war situation has given rise to many problems. The natural tendency is to fill vacancies by advancing men from lower positions and to fill the least technical fields with women. But the men advanced will not always prove adequate to meet the higher position and men of a higher type of training and intelligence will have to be looked for. The groups of untrained girls are going to need supervision by a responsible woman in each case. New positions will develop.

If you are yourself looking for a position, write in at once enclosing stamps for the reply (don't forget it is 3 cents for out-of-town letters) and the card will be forwarded to you to fill out. If you are dissatisfied with the help you have found to fill your vacancies or if you have as yet found none, write in and perhaps the Journal of Electricity can help you out.

It has been truly said that the industrial army at home is fully as important as the army in the field for the winning of the war. The weakest link in the chain at present is that connecting those desiring positions with those looking for help. No haphazard methods of casual advertising or personal hearsay will adequately meet the need. More adequate, nationwide bureaus which would handle questions of professional and technical employment intelligently are needed. The Journal of Electricity cannot, of course, at once reorganize our economic order, but it offers to do its share.

THE AVIATION SIGNAL CORPS

Auto mechanics, radio operators, electricians, magneto repair men, telephone linemen, telephone operators and adjusters and skilled workers of all sorts are needed in the Aviation Section of the Signal Corps of the U. S. Army. Squadrons have been and are now being formed for service abroad.

		POSITION DESIRED	DATE
NAME		OTHER WORK YOU WOULD CONSIDER	
ADDRESS		SALARY DESIRED	
TELEPHONE		LOWEST YOU WOULD CONSIDER	
AGE		LOCALITY PREFERRED	
MARRIED	UNMARRIED	CHILDREN	WOULD YOU WORK ELSEWHERE?
COUNTRY OF BIRTH		WHEN CAN YOU BEGIN WORK	
EDUCATION - WHERE - WHEN		GIVE NAMES AND ADDRESSES OF 2 PERSONS TO WHOM WE MAY REFER	
COLLEGE - DEGREES - MAJOR			
OTHER TRAINING			
PERSONALITY	(LEAVE THIS SPACE BLANK)	DATE	RECOMMENDED TO
PHYSICAL APPEARANCE			RESULT
JUDGMENT, GOOD SENSE			
ENERGY, INITIATIVE			
PROMISE OF GROWTH			
GENERAL FITNESS			
(over)			

THE JOURNAL OF ELECTRICITY SERVICE CARD
This 4x6 inch card has been gotten out by the Journal of Electricity for the benefit of its subscribers. If you are looking for a position, write and enclose stamps for a card to be sent you. On the reverse side space is provided for your employment record with position, firm, length of service and salary. No charge is made for this service to subscribers.

that service should be made greater. With this in mind, a Service Card has been gotten out which will be furnished on application to any reader of the Journal desiring a position; man or woman. These cards are to be kept on file in the Journal of Electricity offices and recommendations will be made from them to employers in need of help.

This is not to be a mere Want Ad Exchange column. As can be judged from accompanying facsimile of the card in miniature, an attempt is made to keep a definite record of the availability of the applicant on all essential points. The back of the card is left blank for the experience record, information as to exact position, firm, length of service and salary being requested.

No charge will be made for this service. The usual fee of commercial employment agencies amounts to 25 per cent of the first month's salary, or 10 per

BUSINESS BUILDING
SELLING IDEAS
DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS
COST KEEPING
ESTIMATING

BREAD-AND-BUTTER BUSINESS

(The manufacturer is in the field for second hand motors but he is not in a position to pick them up; whereas the contractor-dealer comes across many in the course of his business—the moral of the story hardly needs pointing. Here is a way of making the repairing, renting and exchanging of motors a part of your trade with practically no cost to yourself.—The Editor.)

What It Is:

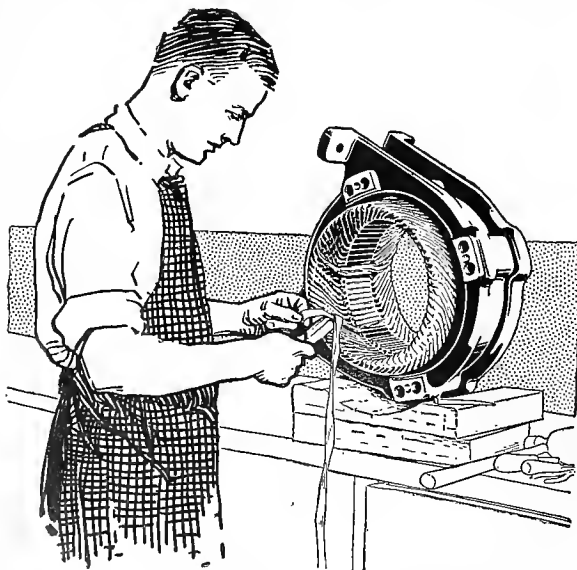
It is the little business—the kind that you pick up here and there by being alert, by keeping your mind active and on the job every moment of the day. It is the kind of business that the help in the store and your outside men can pick up for you.

It is exceptionally profitable because it is incidental, and it is capable of paying a good proportion of your employees' salaries.

The live electrical dealers already have their eyes open for this kind of business because it does not require money for exploitation. The only thing it does require is brains (alertness, ingenuity, and persistence).

How to Get It:

In the motor business there are three classes of



Even second hand motors can be made profitable

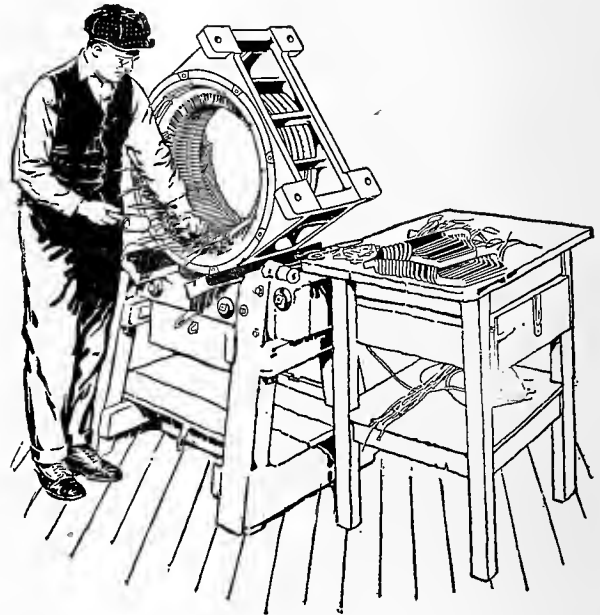
bread-and-butter business incidental to the sale of new apparatus, namely:

- Buying second-hand equipment,
- Making exchanges,
- Rentals.

Electrical manufacturers in the West are making it possible for all electrical dealers to add to their profits through these three avenues. One big motor house on the coast has gotten out a circular offering to buy all second hand motors picked up by the dealer and contractor.

When one thinks of buying second-hand motors, one usually jumps to the conclusion that a large amount of capital is required. In this case the manufacturer furnishes the capital, for he will give you cash for second-hand motors.

Are you taking advantage of this and making money out of every second-hand motor for sale that you run across?



By co-operating with the manufacturer, the renting, exchanging and repairing of motors may be handled to the contractor-dealer's profit without risk.

Are you trying to find out where there are more second-hand motors for sale that you can make money out of?

Dealers are continually finding customers with small motors and wanting a larger one. To offer an exchange proposition will secure the business.

Are you alert to this and are you adding to your profits through this medium? You cannot afford to let this slip by when there is a firm in the business who will supply you or your customer with a new motor in exchange for the second-hand motor.

If you are an agent for some particular manufacturers' motor, you can buy the new motor from the manufacturer whom you represent, and the motor house referred to will take back the second-hand machine, giving you cash for it.

Probably the most attractive bread-and-butter business in connection with motors is rentals. There is a continuous stream of people who want to use a motor for a short space of time, perhaps one month, 2 months, or 6 months. Certainly you are not going to let this kind of business get by. Here is another chance to make money.

Are you making it known to your customers that you can repair their motors for them? Furthermore, are you making it known to your customers that while one motor is being repaired you can rent them another motor to keep them going?

You can rent a second-hand motor from the manufacturer at a special rate provided for electrical dealers and contractors, and in turn you can rent the motor to your prospect or customer. Here is a nice little commission and no investment is required. In addition you get the job of installing the motor, wiring it up, and probably taking it down again.

Further than this, many rentals are ultimately followed by a bona fide sale of new apparatus. If you have the rental, you get an inside track on the new business. Certainly you are not going to let this slip by.

This rental business is so attractive that some electrical dealers and contractors are advertising, "We stock motors for rentals as well as sales. Prompt service is our aim. A telephone call will bring our representative."

Have you ever thought of doing this? Why not act on the impulse and do it now? You can obtain illustrated electrotypes specially designed for this purpose from some of the electrical manufacturers.

If you handle motors at all make it your boast that you can negotiate all kinds of motor business. The general thought applies to other phases of your business as well as motor business.

SILHOUETTE HIGHWAY LIGHTING

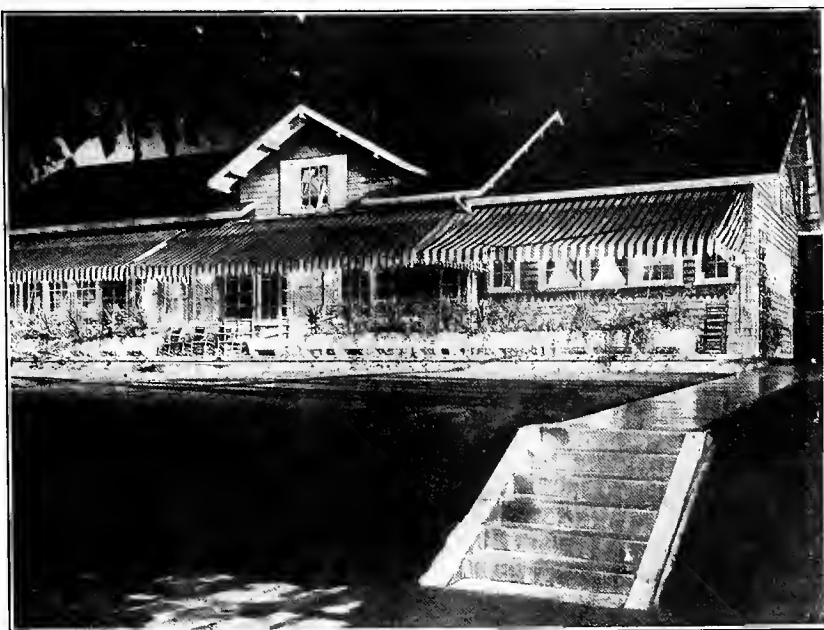
BY S. J. LISBERGER

Usually speaking, under California conditions, our counties and our cities have very little money to spend on lighting. In doing highway work, therefore, the electrical man must face the fact that the county, or the consumer is unable to light the highway as he

would like to have it lighted, and as you would like to light it for him. And therefore you must be very careful in endeavoring to plan your lighting system, to see that you do not light the highway uniformly. Uniform lighting, unless it is of high intensity, is a flat failure. So long as the financial conditions are such that plenty of light is not available you must resort to what we term "silhouette" lighting; that is the placing of a light on a highway in such manner that objects can be distinguished in silhouette, not by so-called direct illumination. That allows you to use a unit of reasonable intensity, reasonable spacings, and gives a fairly good result.

In one community we had certain districts down along the peninsula highway, starting out from the San Francisco city limits and coming down the highway, where in the past they had used 32 candle power lamps. Now, the illumination from 32 candle power lamps spaced as they were, practically on every pole, was very, very poor. Really the economical unit on street lighting systems is practically a 250 candle power unit. That is, in other words, it practically does not pay to put in much less than that, because your pole, your wire, your fixture, which are the main constants going to make up your lighting charge, are irrespective of the size of lamp which you put in the unit, or in the fixture, and the only thing that varies is the amount of power, the extra cost of the renewal of the unit itself.

By using 250 candle power lamps with refractors spaced on every pole, we demonstrated what effective silhouette lighting would do, switching on the old and new systems alternately to give the contrast. They not only changed every light along the highway, but their bills were reduced. Silhouette lighting does not look good in your machine if the other fellow has a headlight on but is extremely effective with headlights turned off.



A POSSIBILITY of new business for the electrical contractor and dealer is suggested by the attractive lighting of the Laurelhurst Club House in Portland, Oregon. Three flood lights are used, containing three 400 watt units mounted on a distributing pole of the power company. Eight other units are used for the flood lighting of the tennis courts and grounds.



CHRISTMAS ADVERTISING

The value of advertising through window displays, demonstrators, newspapers and special sales can hardly be over-emphasized. The man you buy from is just as interested as are you in seeing that your stock is sold. He stands ready to offer window exhibits, sales hints and material for newspaper advertising.

Western Ideas

ELECTRICAL MONKEY BUSINESS not only proved an ingenious scheme for gathering a crowd of spectators but in addition effectively brought out the indestructibility of the Mazda lamps. The Central



SUNBEAM NATIONAL MAZDA LAMPS
and they don't break easily

We installed the lights in the Land Show

WE STOCK ALL SIZES OF LAMPS

10 to 40 Watt 27c.	75 Watt . . . 65c.
60 Watt . . . 36c.	100 Watt . . \$1.00
200 Watt \$2.00	

DISCOUNTS ON QUANTITIES

WE DO WIRING



175 JESSIE ST. NEAR 3RD
SAN FRANCISCO CALIF.
TELEPHONE DOUGLAS 387

Put me away until you need Lamps

tators annoyed him, he threw a lamp at them as far as the cord would allow. And through it all, the lamps burned steadily. A legend which ran "You can monkey with a Mazda lamp" carried the idea home—and the little cards which bore the message conveyed the further information as to the location of the establishment and the stock carried. Not one of the many spectators but conceived a new idea of the durability of the tungsten filaments.

CHRISTMAS WINDOWS like any other form of advertising require a plot and a special direction of appeal. The essential thing to bear in mind is the mental picture you desire produced. In a word, as brought out by H. A. Lemmon, of the Reno Light and Power Company of Nevada, in his excellent papers

Electric Company of San Francisco in their exhibit at the recent Land Show made use of a monkey in a good sized cage with several electric lamps protected by wire guards suspended from the top by substantial cords. These formed the basis of the exhibit—the monkey did the rest. In his antics he threw the lighted lamps about the cage, climbed up them, poked his fingers into them and dropped them in turn. Occasionally when the presence of spec-

published in the columns of the Journal of Electricity for Aug. 15 and Sept. 1, 1917, if you wish to sell me an article for my own use that everyday necessity doesn't demand, you must lead me to form a picture in my mind in which I and the article itself form the principal parts, and the picture must be one in which I seem to be deriving great benefit and pleasure from possession of the article.

In our anxiety to achieve artistic effects and holiday atmosphere in our Christmas window displays, do not let us forget that, first of all, a sales window is an advertisement. It should therefore partake of all the features of an advertisement with the chief purpose in view—to sell goods.

First consider **the space**. A publisher sells you good, plain white space—he doesn't color it up to make it attractive or daub it with splotches of ink to attract attention. Treat your window the same way. Clean all the junk out of it, dust it up and, if necessary, give the woodwork a clean coat of paint. Use a simple, unobtrusive background that will not distract attention from the goods.

The next point to consider in an advertisement is the **illustration**. In a window this feature is supplied by the goods themselves. Arrange them in a logical or orderly manner, giving the proper prominence to the most attractive.

The **headline** is the next consideration. This should always attract favorable attention and, if possible, should contain a selling point. In some cases a window card or strip will be needed to take the place of a headline in a window, but frequently some portion of the display itself will serve this purpose.

The **copy** or body matter of the advertisement is the most important part of all, for it is here that the favorable attention is crystallized into desire, decision, and action. In a window display the copy is represented by the goods themselves and their selling points which should be indicated by little cards, tags, or placards. In some cases the prices themselves constitute selling points and assist the prospect in arriving at a decision.

The above points have been brought out to assist window dressers in arranging windows that shall be **sales windows** in the strictest sense of the word. Every one of the features mentioned should be in every window, although they need not necessarily be separate. In many well arranged windows the goods themselves with their prices can be made to serve as

Let the Children Cook.
A handy little hot plate for young and old in the G.E. electric hot plate. The hot plate is so simple to use and so safe, that it is the perfect hot plate for children's cooking.

Hostesses—Young and Old—Appreciate the Electric Chafing Dish
A chafing dish has always been a favorite Christmas gift. The G.E. Electric Chafing Dish is a really superior to the ordinary chafing dish. It is a real gift.

Coffee—Insurance
The G.E. electric percolator will insure perfect coffee for many Christmas dinners. It is a gift of lasting value and joy.

Many Years of Real Toast
The G.E. electric toaster is the ideal toast maker. As a Christmas gift it is not only handsome and novel but it is a real toast maker every day for years.

All Aboard
Here is an ideal gift for that boy of yours! The Warner Toy Train is a complete set of toy train with all the accessories you need for hours of fun.

A much Appreciated Gift
What a pleasure it is to give something that is really appreciated! The G.E. Electric Gift is a really appreciated gift.

FOR CHRISTMAS SALES

Advertising copy and electrotypes for use in your local paper are furnished free of charge by many of the electrical manufacturers and jobbers. Cuts similar to those shown across these two pages may be obtained in suitable sizes for newspaper use in your own paper as suggested below or in paid advertising.

both illustration, headline, and copy—combining in themselves and their arrangement the functions of all.

A PRE-HOLIDAY WINDOW display, and special sale of electric sewing machines has been bringing in business for one electrical dealer on the Pacific Coast. The J. M. Mullins Electric Co. of Los Angeles,



A pre-holiday sale of sewing machines

which recently occupied a new store in the retail shopping district, filled its large display window with electric sewing machines of a well known make, having some of the machines uncrated and on tables ready for service, while quite a number of machines crated in the back of the window showed that the dealer had ample stock to carry out his scheme. Large attractively worded cards in the window issued the statement "Don't wait till Christmas to Buy Gifts—Buy an Electric Sewing Machine Now—make a deposit and we'll hold the Machine until Christmas." The window was placarded with banners advertising the sewing machine at easy weekly payments. By offering the use of the machines on display to the French Red Cross Society, an effective demonstration of the use of the machine was combined with a patriotic service. The sight of operators from that society busily engaged in making hospital shirts added greatly to the sales value of the window. That the display paid is evidenced by the statement from the dealer that depos-

its were made on quite a number of machines which are to be delivered as Christmas presents.

A STORE PAPER is made up of by an up-to-date dealer of Gardnerville, Nevada. The paper is a four-page sheet, 11 x 14 inches and contains advertisements of the stock carried, local news items, jokes, recipes and well written articles on such subjects as

1c Paid
Gardnerville, Nevada,
Permit No. 1

HOWARD'S STORE NEWS

Published By
HOWARD BROS.

Gardnerville, Nevada. Phone 151

NOVEMBER, 1917

Many a Man Has Regretted. Have You?

Many—many, times we have people tell us that the last lot of merchandise or some article that they sent away for was not worth the postage it took to get it here. Of course it wasn't. In this day and age we all know that we can not get something for nothing, the best we can buy is always the cheapest. Why not buy at home where you can see the article you are buying and are not buying from a picture—any article looks good in a picture. WE GUARANTEE EVERY ARTICLE WE SELL YOU AND ALWAYS SELL FOR LESS.

INSTRUCTIONS FOR ADDRESSING MAIL MATTER TO SOLDIERS AND SAILORS AT THE FRONT.

It is suggested that the following instructions be followed by the United States Postal Authorities for shipping and forwarding for to the front.

State addressed to soldiers at the front should be the name of the soldier, the unit of service to which he belongs, his address, "U. S. Expeditionary Forces," no unit first or last being shown on the envelope or wrapper.

To the care of Soldiers, the name of the unit and that of the letter should be placed on the envelope or wrapper, but no other address.

Packages for Soldiers and Sailors should be prepaid at the 10¢ rate per lb. (1 lb. 12¢) and 10¢ for every fraction of a pound. It should be the limit weight.

For more complete regulations, please see C. O. D. No. 100, Circular 100-100-100.

In order to reach the troops by Christmas packages should be mailed up or as soon as possible after November 10.

OPTIMISM

The tide has turned. Living now more than half way into the twentieth century, the way Americans are running out of it. Some people still would rather believe pessimism than all odds. As an example of pure unadorned optimism, we have recently received the following letter, which was dated by the Baker Road.

"Your letter came. Glad you bought a pair of horses. Hilda is sick. She has dysentery and she will die I think. Clara died this year. She had it too. We are questioned. Poor of father's family have got it. My wife is sick. She hasn't got it. If this thing gets much worse we may have to get a doctor. Then there is bedding good. Everything is O. K."

Don't be the man who put the pit in city.

RUB A DUB DUB—YOUR CLOTHES IN A TUB

Wears out the clothes, breaks buttons, tears finery.

The old-fashioned method is the most expensive so-called "economy."

IT WILL Pay You To Consider

Washing by Electricity With a Western Electric Washer and Winger

With one of these machines you get your clothes in the machine and wash them with electricity. The work is done in a few minutes. There is no rubbing. The clothes are washed clean. There is no need of soap. There are no broken buttons. There are no torn clothes. Think of the saving—and at a weekly cost of about three cents per week.

Wash Electrically. Let Us Tell You How!

FOR SALE BY
HOWARD BROS.

An effective advertising medium

"Why you should trade at home." The paper is exceedingly readable and provides an effective medium for the use of such advertising matter as is provided free of charge by jobbers and manufacturers. By featuring always some one of the electrical devices carried on the front page, Howard Bros. have succeeded in building up a substantial electrical business in a short time.

THE JOBBER AND THE CONTRACTOR-DEALER'S ASSOCIATION

BY W. S. BERRY

(The reasons why a contractor-dealer should belong to a contractor-dealer's organization are here presented from the viewpoint of a jobber. If not to join such an association will mean that the contractor is looked upon as unprogressive and a questionable business risk by the concern which is extending him credit, he can ill afford to resist the prevailing spirit of co-operation. This helpful article is part of an address given before the Washington Association of Contractors and Dealers in Spokane. The author is western salesmanager of the Western Electric Company.—The Editor.)

Three years ago a joint committee of contractors and jobbers found it necessary to preface their report on "co-operation" with the statement:

"It is a recognized fact that certain branches of the electrical industry are today in a very demoralized condition."

Two of the biggest problems at that time were the destructive competition then existing in the contracting business, and the jobbers' loose methods of extending credits to unbusinesslike contractor-dealers who were already in the field or the opening up of new accounts with wiremen who had no business experience or capital, but who thought they would like to take a chance at the contracting game. These two difficulties of course were dependent on each other—and together brought about a congestion in the industry, which was bound to make most of the electrical contracts unprofitable, not only to the new people entering the field but also to such good concerns as were already trying to make a profit. The question was, how to lessen this evil and do it legally. Jobbers could not get together and discuss whether or not they should sell John Doe & Company, nor could a jobber discuss John Doe & Company along this line with one of his own customers, for, as we all know, this would be absolutely against the laws of our country. If a jobber and a contractor took a chance, and John Doe & Company could prove that, owing to such a conversation, the jobber refused to sell them, they would have ample cause for damages against both jobber and contractor. Therefore, to determine who would be a desirable or undesirable customer was somewhat of a proposition, and entailed months of hard work.

It became the problem of each jobber to educate himself, and in most cases reverse the policy which he had long been following, of figuring that the more contractor-dealer customers were on his books, the greater his volume of business and hence the greater his profits. An analysis of past accounts clearly showed that only a few of this class of customers were making a living, and none were saving money for the future, as our friends among the contractors could not make a success on account of the competition from concerns who knew very little about their cost of doing business, figuring jobs and installing work efficiently and economically. We, therefore, each year had to write off big losses caused by bankruptcy of this class of trade.

The Contractor-Dealer Associations have materially helped this situation, so that it has become part of our policy to educate our salesmen so they could not only be a help to their customers in other ways than selling, but also be a help to the Contractor-Dealers' Association to increase their membership. Of course, in thus supporting these associations, urging our customers to join and suspecting the credit of such as did not, we first had to convince ourselves that the Contractor-Dealers' bylaws were legal in every way, especially as to discrimination against competitors.

It has become our policy to explain to the non-member contractor-dealer the good that could be obtained through Association work, under the Constitution and By-laws as generally adopted on the Pacific Coast, which assure reasonable membership fee and annual dues, and to bring repeatedly to their attention that part of the report of the Federal Trade Commission, which was as follows:

"200,000 out of 260,000 firms engaged in business in the United States are merely eking out an existence. 100,000 of them have not earned a penny, and only 10% of the 200,000 firms know the actual cost of handling and selling their product. 40% of them merely estimate their costs and 50% have absolutely no idea of their cost, but merely haphazardly guess and establish their costs arbitrarily."

I have found no one who doubts the accuracy of this report, and it is another argument why, in order for the contractor-dealer to make a success of his business, he must do everything possible to exchange ideas with his competitors as to the best methods to make his business profitable, as it is acknowledged that only in rare instances can a man work out all his problems without experienced help or through an association.

After all this has been gone into thoroughly with the contractor-dealer, it is my belief that one who will not join an association of his own craft is handicapping himself, and therefore is a credit risk that should be carefully watched, as almost invariably the account is a losing one to the supplier. There are a few exceptions which only prove the rule.

During the past three years much has been accomplished by the jobbers towards eliminating doubtful contractor-dealer accounts on their books, and as the jobbers are generally convinced that they can only prosper in proportion to the prosperity of their customers, they are not so anxious to establish in their territory new concerns who are apt to make it next to impossible for those already engaged in the industry to return a reasonable profit. As to present conditions, I can point to many cities on the Pacific Coast where the contractor-dealers are making money, and are among the coming citizens of their respective communities, and only a few cities where practically no progress has been made.

MARINE WIRING

(With the great impetus in shipbuilding, the question of electric installations on shipboard is demanding attention. Vessels intended for use by the various allies must be wired under different rulings which it is important for the contractor to know. The following rules of the American Bureau of Shipping govern the wiring of wooden ships now being constructed for the American government. —The Editor.)

There are various rules promulgated by the different vessel classification bureaus under which vessels are classified.

The rules most generally used are the following:

(1) American Bureau of Shipping, Nos. 60-70 Beaver Street, New York City. All the U. S. Government wooden ships are being constructed under these rules.

(2) Bureau Veritas. Wooden and steel ships being built for the French Government are being constructed under these rules.

(3) Where U. S. Steamboat Inspection Service is maintained, on both river boats and ocean and coastwise boats, forms 801A and 801D and American Bureau of Shipping rules are observed.

(4) Lloyds' Register of Shipping. Used by nearly all of the Allies except French boats which are under the Bureau Veritas, also many boats built for the United States use this register.

(5) National Electrical Code. Used in the United States to some extent.

Rules for the Installation of Electrical Equipment

The following Rules for the Installation of Electrical Equipment on board Vessels have been suggested by the Marine Committee of the American Institute of Electrical Engineers, and have been adopted by the Committee of the American Bureau of Shipping.

(1) **General.**—All apparatus and appliances such as generators, motors, wire, switches, circuit breakers, cut-outs, etc., shall strictly conform in every respect to the Standardization Rules of the American Institute of Electrical Engineers and the National Electrical Code and such special rules under Marine Construction Requirements contained herein.

No wood must be used for any purpose in any part of the installation.

The two-wire or three-wire complete metallic system of distribution is approved. The single wire system of distribution is disapproved.

In vessels carrying petroleum or any substance giving off an explosive gas no permanent conductors must be installed in any compartment liable to contain such fumes. Portable lamps of approved gas-tight construction may be

temporarily used in pump room but the portable wire must be armored and the attachment made outside the pump room. All the metallic rigging of such vessels must be carefully and effectively grounded to the metal hull.

Generators, or storage batteries, required for emergency lighting and power, must be located as far above the load water line as possible. Storage batteries must be properly ventilated and regularly inspected.

(2) **Distribution.**—All main and distribution switchboards must be made of approved non-combustible, non-absorptive, insulating material. Distribution panels must be totally enclosed in metal cabinets. Every circuit leading from a switchboard or distribution panel must be protected by an approved automatic circuit opening device and switch.

Distribution panels must not be located in inaccessible places or such compartments as bunkers, storerooms, cargo holds, or compartments allotted alternately to passengers, live stock, and cargo. They must be so located that the load on one cut-out shall not exceed 660 watts except in the case of motors, searchlights, diving lamps, and electric heating devices.

The method of distribution for cargo spaces must be such that each freight compartment is separately controlled outside the compartment so that the electrical current shall be cut off when the vessel is under way.

(3) **Installation of Wires.**—All electrical conductors must be protected by one of the following methods:

- (a) Armored with metal bands, with or without lead.
- (b) Armored with metallic basket-weave braid, with or without lead.
- (c) Plain braided wires enclosed by iron casing.
- (d) Drawn into metal conduits—either rigid or flexible.
- (e) Placed in metal moulding.

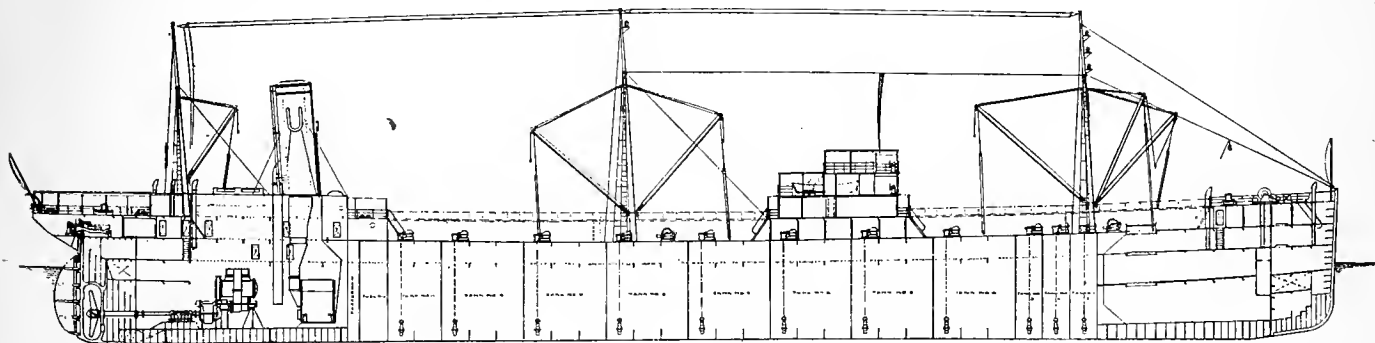
No splices or joints in wires are permitted. Connections must be made by means of approved connection blocks mounted in metal boxes. These appliances must not be located in coal bunkers or other inaccessible places.

Wherever the conductors, protected by flexible metal conduits, metal moulding, or armored metallic bands or braid, are exposed to severe mechanical injury, they must have an additional metallic protection.

(4) **Generators and Motors.**—Generators and motors must be located so as to avoid proximity to steam, water, or other piping, or to be properly protected, from damage coincident thereto.

Name plates must be provided on this apparatus giving the maker's name, rating in revolutions per minute, volts, amperes and kilowatts or kilovolt amperes. The type whether shunt, series, or compound-wound must also be stated.

If the motor starting box does not completely break the motor circuit a switch breaking all poles must be installed between the feeder and the starting box.



The cross section of an ocean liner showing the location of motors for use in handling the cargo

Hand rails must be provided around generators, and similar protection given open type motors if employed.

(5) **Switchboards.**—Main switchboards and distribution switchboards where exposed to mechanical injury, and moisture, must be properly protected. Such switchboards must be accessible from all sides.

For the control of the generator or generators a main switch, circuit breaker and ammeter must be provided for each machine. One voltmeter arranged with switch so that it may read the voltage of all generators and one set of ground detector lamps must be provided. (Separate voltmeters for each generator will be allowed.)

Hand rails with hickory or other approved insulated top must be provided in front of switchboards.

The signal lights must be controlled by an approved telltale board located in pilot house which will indicate a burned-out lamp. Each side of all signal circuits must be brought to this board and fused at this point. The feeder for this board must be continuous from the main switchboard and must not supply any other circuits in the vessel.

Distribution panels located in places not exposed to the weather may be enclosed in non-watertight metal cases. Distribution panels located on the weather deck or placed exposed to the weather must be enclosed in watertight metal cases.

(6) **Installation of Wires.**—All conductors larger than No. 14 B. & S. gauge must be stranded. Except for fixture wiring and signaling systems no single conductor smaller than No. 14 B. & S. gauge shall be employed. No. 16 B. & S. gauge wire may be used for fixture and signaling wire, but in signaling systems energized by over 25 volts the insulation must comply with the requirements for the voltage employed. Bell wires must not be run in conjunction with light or power wire.

All conductors must be led through metallic stuffing tubes when passing through watertight bulkheads, and through all decks. Stuffing tubes through decks must extend to a height of 18 inches above the surface of the deck.

In conduit construction the conductors must not be "pulled in" until all the mechanical work on a given section has been completed. Pull boxes must be installed at sufficient intervals to permit pulling in the conductor without injurious strain. Pull boxes to be of watertight construction and allow an opening in the box at least ten times the diameter of the conductor contained therein.

In armored cable installations, all cables liable to be exposed to weather or moisture must be lead-covered, or otherwise specially protected. They must be carefully "laid" with no short or sharp bends and secured with screwed clips spaced not more than 14 inches apart. Where cables pass through beams, decks, bulkheads, or any part of the metal structure not requiring a stuffing tube the hole through which they pass must be bushed with lead or other material that will not permit chafing or corrosion to take place. No lead-covered, steel-armored cable over one and one-half inch outside diameter to be employed.

Twin conductors up to 60,000 circular mills may be used for all types of installation.

Portable conductors must be made of two or more stranded conductors not less than No. 14 B. & S. gauge laid together and provided with an approved insulation and covering.

On vessels carrying radio telegraph apparatus, all permanent wiring in the radio room and above the top metal deck must be magnetically shielded. Any protection placed around the antennae leads to prevent ready access to same must be of metal, permanently and effectively grounded.

The insulation resistance of the completed wiring installation must conform to the requirements of the National Electrical Code.

The size of all wiring and cable conductors must be in accordance with the following Table of safe capacities:

No. of Wires or Strands	Size of Wires or Strands B. & S. Gauge	Capacity in Amperes	No. of Wires or Strands	Size of Wire or Strands B. & S. Gauge	Capacity in Amperes
1	19	—	19	17	60
1	18	3	19	16	70
1	17	—	37	18	85
1	16	6	37	17	100
1	15	—	61	18	120
1	14	12	61	17	145
1	12	17	61	16	170
7	19	21	61	15	200
7	18	25	61	14	235
7	17	30	91	15	270
7	16	35	91	14	320
7	15	40	127	15	340
19	18	50			

(7) **Suggestions.**—Great care should be exercised in running electric leads in the vicinity of the magnetic compasses. If the leads carry large currents, in excess of 100 amperes, they should be crossed.

It is strongly recommended that all metal work above the top metal deck, including metal rigging for all masts and funnels, be permanently and effectively grounded. All short exposed flexible leads, such as those to searchlights and running lights, should be provided with a metallic shield well grounded to the hull of the vessel.

It is recommended that a switch be placed in the ground detector circuit on the main switchboard so that this ground connection may be broken when it is desired to test out the various circuits in the vessel.

It is strongly urged that a complete test of the insulation of the entire electrical equipment be made at least every six months and a copy of report forwarded to this Bureau.

HOW TO REDUCE THE COST OF MERCHANDISING

BY W. M. DEMING

That the relations between the manufacturer and dealer are a serious problem in other lines of industry as well as in the electrical field is indicated by the comments of a manufacturer of refrigerators during a recent discussion of present-day business conditions from a merchandising point of view. He said:

"It has gotten so we not only have to figure on what's good for us, but what's good for our dealers also. We sell them a line of refrigerators—they have to go into their stores personally and show the clerk how to handle customers and sell our goods; then show the manager how to advertise. We give him window displays. We may get our money right off the bat, but the sale isn't really closed until the goods have been sold by the store and found satisfactory by the housewives. We then have to follow our goods into the homes, for if one refrigerator proves unsatisfactory, the woman of the house starts talking and kills ten sales we would otherwise have made. A salesman used to merely go around and take orders: once the order was signed, we considered it settled, but today everybody is in a sense a salesman and the goods are a liability until they wear out."

While these remarks refer to a line of refrigerators, they are particularly applicable to current consuming electrical devices.

For instance, one electric device improperly installed or improperly used may seriously retard or even kill the introduction of such devices in a given district. Unintelligent, indifferent or inexperienced handling of a prospective user may have equally serious results.

Sales of electrical appliances for the home in 1916 exceeded sales for 1915 by more than 100% and there is a rapidly growing realization in the minds of the public that such appliances are an important factor in solving the servant question. In many cases a well-selected assortment of electrical devices, in conjunction with proper instructions as to their use, has enabled the housewife to dispense with servants and still not be subject to the drudgery of housework incident to old-fashioned methods.

The central station in seeking ways to increase the use of electrical energy from its lines entered the merchandising field to insure suitable exploitation of current consuming devices in its territory. The manufacturer naturally welcomed and encouraged any plan which tended to increase the demand for his product.

It would seem therefore that a material saving to all concerned, through reduction in the cost of merchandising, could be effected if the electrical dealer would make a careful study of the essential requirements from the central station and manufacturer's viewpoint, necessary for the successful exploitation of current consuming and other electrical devices. The central station can also do much toward improving conditions by giving local dealers active support and allowing them to become acquainted with and profit by its own experience.

SPECIAL LIGHTING FOR MULTNOMAH FIELD IN PORTLAND

BY F. H. MURPHY

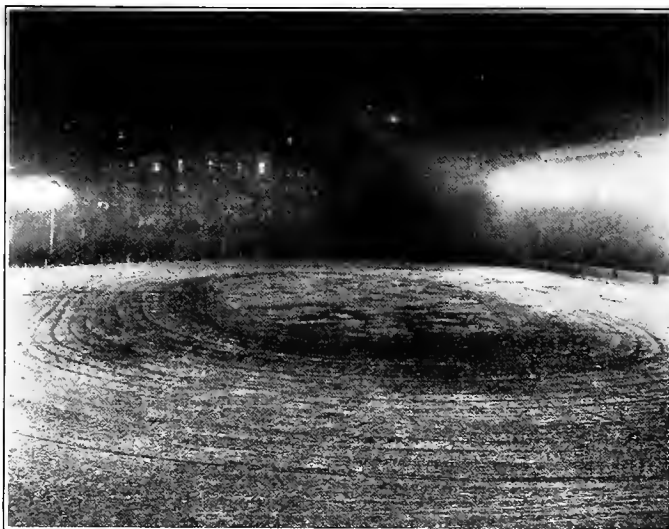
(Even the winter does not interrupt the outdoor drilling and athletics in the West. Fields designed for the use of Home Guard units as well as outdoor tennis matches and the like which must be staged at night, present an interesting problem in lighting. The example of this Portland field where various methods were experimented with should prove helpful. The author is illuminating engineer with the Portland Railway, Light and Power Company.—The Editor.)

For some time the proper lighting of Multnomah Field, so as to enable the staging of evening events at that place, has been in the minds of a number of people. However, nothing definite had resulted until early this summer. It is true that a feeble attempt had been made to give some lighting to the field by means of two messengers strung across the field supporting eight carbon arc lamps about 30 to 32 feet above the ground. This, however, was very unsatisfactory for any purpose.

Early in the past summer it was decided to stage a Western Round Up on the field, giving both afternoon and evening events. This made it absolutely necessary that something be done in regard to the lighting. Furthermore, the field was even at that time being used practically every night for the drilling of Home Guards and the lighting supplied by the arc lamps was entirely unsatisfactory for this purpose.

Since the field is used for baseball and football games, as well as for other athletic purposes, it was deemed unadvisable to permit overhead messengers of any nature, even at a height of 60 or 70 feet above the ground. This, therefore, meant that the lighting must be done from the sides. Flood lighting units were at first considered but were almost immediately eliminated because of high first cost of installa-

tion. The method finally adopted consisted of 26 1000-watt units, 13 upon either side of the field and mounted approximately 45 feet above the ground, the spacing between units being about 25 feet. On the grandstand side of the field the units are mounted



READY FOR THE ROUND-UP

The Multnomah field as lighted for the night performance of a Western Rodeo. In the Home Guard drilling, the lights on only one side of the field are lit. Note the absence of overhead wires and equipment which would interfere with the daylight use of the field for football.

immediately beneath the edge of the roof. On the opposite side of the field three poles were erected and the units suspended from a $\frac{5}{8}$ inch messenger cable supported by the poles.

The average illumination over the field, as shown by a recent test made upon a 36 inch plane, is 1.55 foot candles, whereas the average illumination in the area in front of the grandstand in which special roping features and other special events were staged, is 2.786 foot candles. This illumination proved sufficient for the various Round Up events and the public was very well satisfied with the result.

On drill nights the illumination is turned on on one side of the field only, this giving sufficient light for such purposes.

The cost of the installation was approximately \$23.55 per unit.

The field is approximately 450 feet long by 270 feet wide, and this represents the first installation, so far as the author is aware, in which a permanent installation has been made in the West of such a nature as to successfully stage a Western Round Up event.

ADJUSTABLE SOCKETS IN LIGHTING

BY J. W. MORRIS

The problem of connecting up a small series lighting system comes up all the time where you have a 2200-volt line running, and you have to take in possibly one or two blocks of 20 or 30 lights.

The adjustable socket system meets the difficulty without involving the coil regulator where there are a couple of blocks that you want to give series lights. The adjustable socket system consists of a lighting transformer, and across each lamp a little reactance coil, which, if the lamp burns out, takes up the voltage of the lamp.

OREGON ASSOCIATION OF CONTRACTORS AND DEALERS

A special meeting of the Oregon Association of Electrical Contractors and Dealers was called on November 17, 1917, by J. R. Tomlinson, chairman of the Committee on Permanent Organization, for the purpose of adopting a new constitution and by-laws. In the absence of the president, S. C. Jaggar, vice-president, presided and presented his report upon the Convention of the National Association held at New Orleans.

The following resolutions were adopted:

Be It Resolved, That the Oregon Association of Electrical Contractors and Dealers does hereby amend its present constitution and by-laws by substituting the attached copy (which is hereto attached and made a part of this resolution) of the Constitution and By-Laws of the National Association of Electrical Contractors and Dealers together with the prescribed form of the State Constitution and By-Laws, in accordance with the legislation enacted at the Annual Convention of the National Electrical Contractors' Association held at New Orleans, October 11th, 1917.

Be It Resolved, That in accordance with Article V, Section I of the Constitution, that the State of Oregon be comprised of three districts as follows: District I shall be all that portion of the state lying west of the Cascade Mountains and north of the 45th parallel of latitude including Salem, Oregon, District II all that part of the state lying west of the Cascade Mountains and south of Salem and the aforesaid parallel, and the third District all that part of the state lying east of the Cascade Mountains.

Be It Resolved, That the membership fee of the Oregon State Association of Electrical Contractors and Dealers shall be \$25.00.

Be It Resolved, That the annual dues of the Association shall be as per following schedule and classifications:

	National.	State.	Total.
CLASS A. Less than \$12,000 annually	\$ 5.00	\$35.00	\$40.00
" B. \$12,000 to \$25,000 "	7.50	40.50	48.00
" C. \$25,000 to \$50,000 "	10.00	50.00	60.00
" D. \$50,000 to \$100,000 "	20.00	60.00	80.00
" E. Over \$100,000 "	30.00	70.00	100.00

Dues to be paid quarterly in advance on or before the 15th of January, April, October and July.

Mr. J. Willis Oberender has been retained as the State Secretary-Treasurer of the Oregon State Association of Electrical Contractors and Dealers. Mr. Oberender has held the same position for the State Association since its inception, Feb. 9th, 1915, and has devoted the greater part of his time to association effort. He is a native son of the State of Oregon and for many years was employed in the Motive Power Department of the Southern Pacific Company. In 1912 he was admitted to practice by the Supreme Court of Oregon, and has ever since that time

been engaged in the practice of law. Mr. Oberender will hereafter devote practically his entire time to Association work. He has recently entered as a contestant from Oregon in the Journal's subscription campaign.



Allen S. Halls, whose election as State Chairman of the Oregon State Association of Electrical Contractors and Dealers



was confirmed at the meeting held Nov. 17th at the Multnomah Hotel, is the managing engineer of the National Electric Company with offices at 517 Railway Exchange Bldg., Portland, Oregon. Mr. Halls has had broad experience in electrical construction work of all kinds, and the members of the Oregon Association feel that they are exceedingly fortunate in securing his services as State Chairman. Mr. Halls was formerly a member of

Miller & Halls, electrical contractors of Portland, and also at one time Northwest Manager of the Pacific Fire Extinguisher Company and has held several other positions of trust requiring expert knowledge of electrical construction work.

Be It Resolved, That it is the will of this meeting that all officers elected at this meeting and at the executive committee meeting to be held immediately after the adjournment of this meeting shall hold their respective offices until the annual meeting in the year 1919 or until their successors are elected and qualified.

The election of members of the executive committee resulted as follows: District I, J. R. Tomlinson unanimously elected, B. W. Paul elected by a majority for District II. No member of the third district being present, this was referred to executive committee for action.

At a later meeting of the executive committee J. L. Vaughan was elected a member of the executive committee from the 3rd district. Allen S. Halls, president of the Association, was unanimously elected chairman of the state executive committee and S. C. Jaggar as delegate for the State of Oregon to the Pacific Division. J. W. Oberender was retained as Secretary-Treasurer.

Standing committees were appointed as follows:

Membership, Finance and Program Committee—J. R. Tomlinson and A. C. McMicken.

Legislation and Publication Committee—B. W. Paul, J. L. Vaughan and R. G. Littler.

Jobbers and Manufacturers Committee—A. S. Halls and H. H. Sroufe.

Central Stations Committee—J. R. Tomlinson and F. C. Green.

Educational and Costs Data Committee—A. S. Halls and C. P. Scott.

The following firms were represented at the special meeting: F. A. Bauman & Co., Beaver Electric Co., E. L. Knight & Co., A. E. Messerve, Morrison Electric Co., NePage McKenny Co., Pierce Tomlinson Electric Co., Scott Electric Co., Sturges & Olsaver, Vanderlip & Lord, M. J. Walsh Co., West Coast Engineering Co., Western Electric Works, Apple City Electric Shop, Comet Electric Co., Roseburg Electric Co., and B. W. Paul, and Associate Members: Portland Railway, Light & Power Co., and Portland Electrical Maintenance Co.

Technical Hints

BY GEORGE A. SCHNEIDER

(There is an increasing demand for remote control switches for the control of lighting and power circuits in theatres, public buildings and the like, and this information on the various types which are on the market, their advantages and disadvantages, will prove helpful to the wide awake contractor-dealer. The difference between a successful time clock and an unsuccessful one is further shown to depend on two or three simple conditions which it is worth while noting in the installation.—The Editor.)

REMOTE CONTROL SWITCHES

Remote control switches are now extensively used for the control of lighting and power circuits in theatres, factories, central stations or similar installations where it is desired to control circuits, carrying heavy currents, from a distance and where it would be too expensive to run the main leads to a remote point of control. Certain types are also very largely used for the control of motor circuits.

For convenience in discussing the common types which are of interest to the contractor and dealer these switches may be classified as follows:

(a) Electrically operated; mechanically held. This type has two operating coils—one coil for closing and one for opening—but is mechanically held when closed. Coils are in circuit only at instant of opening or closing.

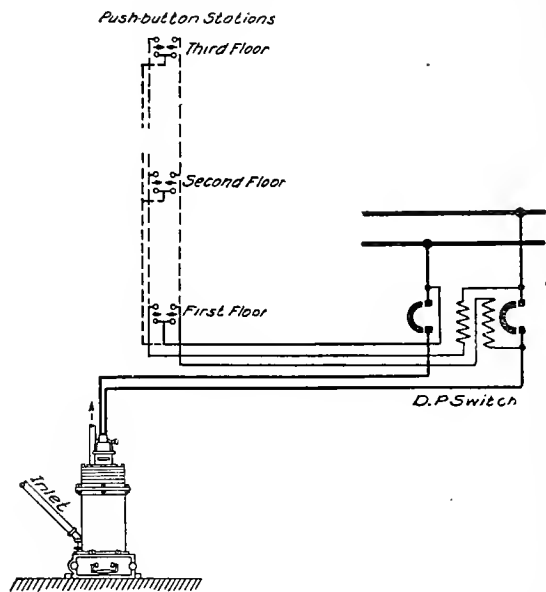
(b) Electrically operated; electrically held. This type has only one operating coil which closes switch and holds it in a closed position. Coil is continuously excited as long as switch is closed.

(c) Manually operated; mechanically held. This type has one coil only for the purpose of tripping switch to open. Coil is in circuit only at instant of tripping. Switch is held mechanically when in closed position. Usually switch is only opened in emergency.

There are a number of switches in the market which are in accordance with each of these various classifications. One of the the most popular types which operates as outlined under (a) is designed much on the order of a standard line of air circuit breakers, in fact, some of the breaker parts are used in the remote control switches. This switch is operated by a double-coil solenoid—one coil for closing, one for opening—controlled by a special, single-pole, two-circuit, push button switch which is normally in the open position and remains closed only when held by the operator. To open or close the switch the corresponding push button has to be pushed in. One of these switches is furnished with each remote control switch and must always be used, as the operating coils of the switch are not designed to carry the exciting current continuously. It is therefore necessary that the push button switch must be of the momentary contact type. With this scheme of operation and control, the solenoids are energized only at the instant of closing or opening and the switch is held in the closed position mechanically. When tripped it opens by gravity. The switches are also arranged with a handle so they may be manually opened or closed. They are furnished in sizes up to 300 amperes in single, double or triple-pole, for direct or alternating current and for voltages up to and including 250 volts.

Any number of control switches may be used. They are wired in parallel as shown in Fig. 1, which shows the connections of a double-pole switch controlling a vacuum cleaner equipped with a single-phase motor. The cleaner may be started or stopped from any of the three floors. These switches may also be used on other circuits by providing switches of the proper number of poles and with operating coils suited to the voltage.

It should be noted that this type of switch does not give under-voltage protection since it is mechanically held and will remain in the closed position even though the energy is removed from the line. Therefore, in case the motor is shut down, due to the energy having been removed from the line, it will again start automatically when the voltage is again up to proper value. On this account there are some installations in which this type of remote control switch may not be desirable. For further informa-



Connections for typical class (a) double-pole remote control switch with three control stations. Complete control from any station.

tion on this subject our readers are referred to this department in the Journal of Electricity for November 1st.

Switches of the (b) class are known as magnetically operated switches or contractors. By reason of their construction, they are also sometimes called clapper type switches. These switches have a single operating coil which serves not only to close the switch but also to hold it in a closed position; that is, the switch is magnetically held. The operating or solenoid circuit is closed as long as the switch is closed.

Due to the fact that the operating coil is continuously excited, this type of switch for alternating current circuits is likely to be noisy unless carefully designed and adjusted. This point must be taken into consideration when installing switches where the noise would be objectionable.

For operating this type of switch only two wires need be carried to the points of control. Any standard make of single-pole switch whether of the snap,

push or knife type will be suitable. Where more than one station is required, the various switches would be wired in parallel. This scheme will permit opening or closing the remote control switch from any station but will not permit closing from one station and opening from another. If this method of control is necessary, it can be secured by using two three-point switches when two points of control are wanted, or by using a four-point switch in addition to the two three-point switches for each additional control point that is desired. That is, complete control from four points will require two three-point and two four-point control switches and so on.

Like the class (a) switch just described, this form of switch will not give under-voltage protection. Since the operating coil is excited while the switch is in the closed position, the switch will return to the off position in case of reduction or failure of voltage but will again close upon return of voltage. By providing a set of contacts on the remote control switch for the control circuit, these switches can be arranged to give under-voltage protection which is necessary in connection with certain classes of motor installations. To secure this protection it is necessary to run three wires between the switch and various points of control and to provide special push button switches each having a starting and stopping button at each point of control. This scheme permits the switch to be opened or closed from any station, but in case it opens due to failure or reduction in voltage, it will remain in the open position until again closed by pushing in the starting button at one of the control stations. One of the standard lines of double-pole switches or contactors are regularly equipped with these extra contacts on the switch and may be wired for either two- or three-wire control as just described. This form of switch is used extensively with alternating current motors of those types and sizes that may be started by being thrown directly across the line at full voltage.

Switches of the class (c) type are similar in design to shunt-trip circuit breakers, or are modified designs of standard knife switches equipped with suitable spring release actuated by a trip coil. They have only one operating coil which is for the purpose of tripping the switch, usually in emergency, from some distant point. The coil is in the circuit only at the instant of tripping, since these switches are designed to be manually closed and mechanically held. Two control wires are required between switch and each control station. Single-pole switches are suitable and when more than one station is needed all control stations are wired in parallel. This permits tripping the switch from any point. These switches do not give under-voltage protection and cannot be arranged to do so.

Switches of this type are required in some cities in certain classes of public buildings to permit the fire department, in case of emergency, to completely disconnect the electric service without entering the build-

ing, from suitable push button stations placed in the principal entrances to the building. Both the class (b) and (c) switches are regularly made in almost any capacity required.

Unless the distance from the switch to the various control points is so great as to cause a decided drop in voltage, No. 14 wire, as specified by the National Electric Code, may be used for any of the types of switches here described. They will generally operate on voltages as low as 80 per cent of normal. Where special long runs between stations are required, the question of wire sizes for the control circuits should be taken up with the manufacturer.

There is an increasing demand for apparatus of this class and it will pay the dealer and contractor to become familiar with the various types and their application. The points covered in this article are those which are most frequently brought up when these schemes of control are being considered.

INSTALLATION OF TIME CLOCKS

Time clocks, like many other electrical control devices have been greatly improved during recent years, and when properly installed and cared for are now quite dependable. Most of them have eight day works and other than regular re-winding and an occasional re-setting required on account of the change in lighting hours for the various seasons of the year, need very little attention. However, when placed in unfavorable positions and carelessly handled they usually become a source of much trouble—in fact, a nuisance.

To avoid the most common cause of trouble, time clocks must be set so they will not be subject to excessive vibrations or heavy jars, moisture or wide changes in temperature. This means they should not be placed near doors which are frequently opened or closed or near elevators or in the same room with steam heating or hot water plants. The position should likewise be such that they are conveniently accessible for re-winding or adjusting. Plenty of light, either natural or artificial, should be available when needed in handling the clock. The door should be kept tightly closed to eliminate dust. The clock should also be kept sufficiently far away from the cut-outs and switches so there is no danger of the door coming in contact with them when it is open.

Oil should be applied sparingly and then should be of a good grade of light mineral oil such as would be suitable for any kind of clocks. Oil that is used for general machinery is not satisfactory and will quickly clog up the mechanism.

These seem like very minor faults, but it is indeed surprising to note how many faults which develop in time clocks are due to just such causes. Especially is this true of vibration or excessive jars because these, as a possible cause of trouble, are so often entirely forgotten.

WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(How should you go about it to apply for a patent? Do you have to submit a working model? How does the government determine whether your invention is patentable or not? How long must you wait before action is taken? Such important questions as these are considered in this article by two prominent patent attorneys of San Francisco, members of the firm of White and Prost.—The Editor.)

Combination Claim

A claim, specifying a number of elements combined together in a combination, is frequently termed a "combination claim." The law presumes each of the elements, so specified in a combination claim, to be old. The inventive act, in creating the novel combination so claimed, consists in bringing together, in co-operative relation, the various elements specified in the claim. The invention, covered by a combination claim, is the combination considered as an unity distinct from the elements composing it. Such a combination may be novel notwithstanding each of the elements thereof is old.

A poet is entitled to copyright his poem notwithstanding it is merely a novel combination of words each of which is old and may be found in the dictionary. The poet's creative work consists in bringing together, in a new relation, a number of old words. The combination of words, constituting a poem, is considered as an unity distinct from the words of which it is composed.

There is a close analogy between the creative work of the poet and the creative work of the inventor. The poet may express his ideas in new combinations of old words. The inventor may express his ideas in new combinations of old mechanical elements. In the one case, it is the new combination of words of which a monopoly is granted by the copyright. In the other case, it is the new combination of mechanical elements of which a monopoly is granted by the patent.

A copyright on a poem does not grant a monopoly of the various words, thereof, separately considered apart from the combination thereof constituting the poem. A patent on a novel combination of mechanical elements does not grant a monopoly of the various elements thereof, separately considered apart from the combination thereof constituting the invention.

Patent Application

The first step taken to obtain a patent is the filing of an application therefor in the United States Patent Office at Washington, D. C. The government fee for filing an application is \$15.00.

The application for a patent on an invention, capable of embodiment in a machine, comprises a document containing:

- 1st. The inventor's formal petition for the grant of a patent.
- 2nd. Drawings illustrating one form of machine in which the invention may be embodied.
- 3rd. A specification constituting a description of the machine shown in the drawings.
- 4th. Claims.
- 5th. The inventor's oath as to being the inventor.

Skill Required in Writing Application

The Supreme Court of the United States, in the case of *Topliff v. Topliff*, 145 U. S., 169, said:

"The specification and claims of a patent, particularly if the invention be at all complicated, constitute one of the most difficult legal instruments to draw with accuracy, and in view of the fact that valuable inventions are often placed in the hands of inexperienced persons to prepare such specifications and claims, it is no matter of surprise that the latter frequently fail to describe with requisite certainty the exact invention of the patentee, and err either in claiming that which the patentee had not in fact invented, or in omitting some element which was a valuable or essential part of his actual invention."

Patent Office Advice Regarding Patent Attorneys

Patent Office Rule 17 reads as follows:

"An applicant or an assignee of the entire interest may prosecute his own case, but he is advised, unless familiar with such matters, to employ a competent patent attorney, as the value of patents depends largely upon the skillful preparation of the specification and claims. The office can not aid in the selection of an attorney. . . ."

Model

No model of a machine is required to be filed with the application for a patent thereon. Furthermore, it is not necessary to make a machine or any model thereof, before applying for a patent thereon.

However, the making, use or sale of a machine for a period of less than two years before the filing of an application for a patent thereon is no bar to the grant of a patent thereon. It is, nevertheless, advisable for an inventor to file his application as soon as possible after the perfection of his invention.

Prosecution of Application

If the application, as filed, be allowed without objection, a patent issues thereon. Such a patent contains an exact copy of the drawings, specification and claims forming a part of the application as filed.

As a general rule, applications are not allowed as filed.

Upon the receipt of the application by the Patent Office it is dated and given a serial number. A notice of such date and serial number is immediately sent to the applicant's attorney. The application is then sent to the classification department, where it is briefly examined to determine the art to which the invention relates, and from there it is sent to the proper examining division. There are forty-three examining divisions, in charge of each of which there is an examiner and his assistant examiners. In 1916, there were three hundred and thirty-four assistant examiners actively engaged in considering applications.

In each examining division, the applications are examined in the order of their respective filing dates. By reason of the examiners being insufficient in number to promptly consider each application, an application is not acted on, as a general rule, until about four months after the filing of the same in the Patent Of-

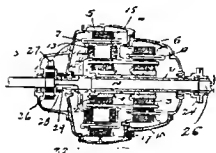
fice. In many instances, the first action on the application is delayed for a much longer period.

Such a delay, in the first consideration of his application, often works a great hardship on the inventor because, until said first action, he is left in the dark as to the attitude of the Patent Office toward his application. To remedy delays of this kind, it will be necessary for Congress to increase the Patent Office examining corps.

RECENT PATENTS

Electromagnetic Power Transmission Apparatus

Much interest has been evidenced of late in electromagnetic variable speed power transmission mechanisms for automobiles and turbine driven ships. United States letters patent No. 1,242,714, issued to Alfons H. Neuland of San Francisco, discloses one form of mechanism of this nature which meets the requirements of automobile and ship drives.

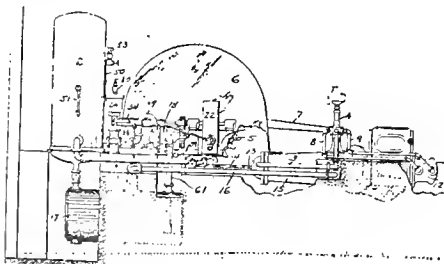


This mechanism consists generally of two axially aligned stators having interconnected windings and two rotors mounted on a shaft and arranged within the stators, the rotor windings being also interconnected, and arranged between one rotor and stator is a rotatable field structure. Rotating with the field structure and electrically connected to the field coils is a commutator and the commutator brushes are connected to the other stator.

The field is excited from a source of direct current and the field structure is connected to the engine or turbine, the rotor shaft being the driven element. When the field is energized and the structure rotated, polyphase currents will be generated in the associated stator and rotor windings. The polyphase currents generated in the rotor pass into the other rotor and produce a revolving field therein and similarly a revolving field is produced in the other stator, the two fields having equal angular velocities, and being displaced from each other so that each field exerts a torque on the other. The direction and magnitude of the torque is variable by displacing the stator poles with respect to the rotor poles. This torque, in either direction, is maintained by the stator at all speeds of the rotor. The speed of the rotor may be varied with relation to the speed of the field structure from zero to near synchronism without the dissipation of energy in external resistances.

Pressure Regulating Apparatus

A new form of governor for water wheels is shown in Patent No. 1,243,073, issued to L. M. Karnasch, of San Francisco, and assigned to the Pelton Water Wheel Co. This



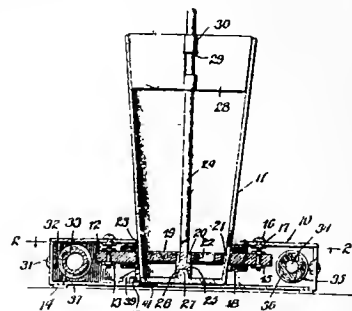
governor operates to vary the position of the needle valve in the nozzle, so that the speed of the water wheel is maintained constant under varying loads on the direct connected generator.

Oil under pressure is the actuating medium for moving

the needle valve and it is essential that a supply of oil under constant pressure be maintained so that the needle will respond to the governor with constant sensitiveness. A small water wheel is used to drive the oil pump and the oil is forced into a closed receiver, so that the pressure on the oil varies with the height of the oil. A float in the receiver is operably connected with the needle nozzle of the small water wheel so that as the level of the oil in the receiver tends to fall, the small water wheel and consequently the oil pump is speeded up.

Electrical Drink Mixer

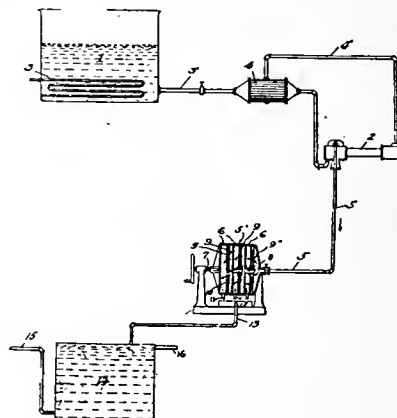
It seems fitting that a man from Bountiful, Utah, should have invented a drink mixer. Patent No. 1,242,493, issued to Richard H. Stringham, shows a novel electrical drink mixer in which the glass is surrounded by a stator in which a



revolving field is produced. The rotor, which consists of a mixing impeller, is placed within the glass in the plane of the stator and the rotating field produces rotation of the impeller and the drink is mixed. Whether the flux in passing through the drink will increase the charge in or for it is not apparent.

Method for Separating Mixtures of Liquids

Patent No. 1,242,784 has been issued to Ernest L. Dyer, of Oakland, and Arthur R. Heise, of Avila, on a process of separating water from emulsified mineral oils.



In this process the emulsion is passed through a capillary medium under pressure so that the film of oil surrounding the water globule is broken down and the water liberated.

Other Electrical Patents

Other patents of interest include 1,243,043, issued to Alfred H. Cohen, of Oakland, on an apparatus for producing oscillating currents of high frequency, the novel feature of which appears to be the circulation of liquid under pressure between the electrodes at which the spark is formed.

Patent No. 1,243,429, issued to Ferdinand W. Krogh, of San Francisco, discloses a thrust bearing for a vertical shaft and possesses several novel features.

Decision

In a suit brought by the General Electric Company against Electric Controller and Manufacturing Company on claim 7 of the Carichoff patent No. 763,658 for a controller for electric motors, the Court held the claim to be valid and infringed.

SPARKS—Current Facts, Figures and Fancy

(A new device for the convenience of the wounded in the hospital wireless telephone, the saving of gasoline by the use of electric vehicles in England, electrically increasing the egg supply—the demands of war are leading to improved methods and greater efficiency everywhere. And the answer to both needs is electricity.—The Editor.)

Sixty-seven street railway companies in twenty-one states have been allowed fare increases in some form since 1914, according to the committee on public utility rates of the National Association of Railroad Commissioners.

* * *

By burning two 50 watt lamps in his hen coop, from 5 to 7 in the morning and from 4 to 6 p. m., during the winter, one farmer has persuaded his hens that it was summertime and has increased the production of eggs about two and a half times.

* * *

In view of the plea for standardization in electrical manufactured goods, it is interesting to note that the high cost of shoes in both France and England has caused those governments to adopt a uniform type of foot wear designed for the civilian population.

* * *

The labor market is feeling the influence of the low immigration due to the war. Fewer foreigners entered the country in the year ending June, 1917, than in any year since the beginning of the war—not more than one-fourth the number admitted in 1914, in fact.

* * *

Despite the war, Switzerland still continues to manufacture electric motors and dynamos in the usual number, but as copper is scarce aluminum is employed as far as possible. Motors built of aluminum are of larger size, but lighter and cheaper. Sometimes they are built up to 800 horsepower.

* * *

A new standard of prosperity for public utility owners is to be found in the statement of the Treasury Department that the average citizen of the United States has today, or should have, if he has his share, \$45.50 in his inside pocket. This is six dollars more than the average at the same time a year ago.

* * *

Canton, it appears, is about to exchange her walls for an electric tramcar system. Her wall is six miles in length and contains, it is computed, 421,000 square yards of bricks, 450,000 square yards of stone, and 1,000,000 cubic yards of earth. What is more, the removal of the wall means the removal also of some 5000 houses.

* * *

The practice of selling telephone numbers, although apparently good form in Japan, is not to be countenanced in America. Some unsuspecting subscribers in San Antonio, Texas, who paid as high as \$15 for well-known numbers, are out their money because those who sold them have left town and the telephone company refuses to recognize the transaction.

When the war is over Germany will again become our competitor in electrical fields. It is interesting, therefore, to note the steady rise of wages in industrial fields in that country. The Bremer Burzer Zeitung gives comparative wage schedules from 1914 to 1916, showing a rise of 65 per cent in the electrical industries for men, 75 per cent for women.

* * *

The high price of gasoline (it is now costing more than \$1 per imperial gallon) and the multiplying of electrical supply stations are said to be creating a new demand for electric vehicles for both pleasure and commercial purposes in the United Kingdom. There are now 1,000 commercial electrics in use in England against one-sixth that number before the war.

* * *

Even a deaf and dumb man can answer the ring of an electric bell. One such unfortunate left alone in the house to answer the doorbell kept a little stick resting against the electric bell, which fell to the floor when the bell rang. His little dog, who was kept near the door, was trained to pick up the stick and carry it to his master, who thereupon answered the door.

* * *

A new wireless telephone, invented by a Los Angeles man, is to form part of the equipment of one of the base hospitals in France. With the use of the invention it will be possible to furnish music to the individual patient in a hospital while the sufferer in a cot near by will hear no sound. Nurses also will be able to read newspapers and stories with the use of the apparatus to several hundred patients at the same time.

* * *

According to the University of California Agricultural Department, by wearing your woolen suit longer, you permit more mutton to be marketed, there is less demand for other meats and for the cereals to feed them, and so the cost of bread is kept down and the supply of wheat increased. Any failure to cut down waste in your business starts a ripple that spreads farther than you can see—and may come back to you indeed, in increased grocery bills and a longer war.

* * *

The electrical industry, with every other, has suffered to some extent from the freight congestion. In the face of tremendous difficulties, however, the railroads have handled the situation surprisingly well. Freight statistics for July, the latest month for which official figures are available, show that the railroads successfully handled 20.2 per cent more freight that month than for the same period last year. This great increase in service was rendered with an almost negligible increase in the amount of equipment used.

PERSONALS

Lieutenant Colonel Richard Park, widely known as "Captain" Park—for as such he rendered wide and far-reaching service in first organizing the engineer regiments in the West, is receiving congratulations on all sides for his much deserved promotions, first to Major and now recently to Lieutenant Colonel. "Somewhere in the West" is the only way his location can be published not only because of censorship rules but also due to the intense activity of this leader in organization. From all quarters of the West this news of his promotion will as a consequence be received with unusual interest.



C. G. A. Baker, of Baker-Joslyn Co., is making an extended Eastern trip and will probably return the middle of January.

J. H. Lockett has been appointed master mechanic of electric lines of the Southern Pacific Company at Oakland, Alameda and Berkeley, Cal.

Miss C. C. Tessier has received appointment as Assistant Secretary and Treasurer of the American Public Utilities Company, Salt Lake City, Utah.

Roland G. Marx, an electrical engineer, Palo Alto, Cal., has been transferred to the grade of member in the American Institute of Electrical Engineers.

J. L. Yardley, general engineer of the Westinghouse Electric & Manufacturing Company at East Pittsburg, is making a tour of Pacific Coast cities.

J. M. Bradner, formerly with the San Francisco office of the General Electric Company, has received a commission as captain in the United States Reserves.

O. M. Hartshorn, formerly secretary of the Pueblo Gas & Fuel Company, Pueblo, Colo., is now secretary of the City Light & Water Company, Amarillo, Texas.

E. R. Waite, who was in the general bookkeeping department of the Denver Gas & Electric Light Company, is to be secretary of the Pueblo (Col.) Gas & Fuel Company.

Lyman P. Hammond of Bonbright & Company has been elected a director of the California Railway & Power Company, increasing the directorate to twelve members.

Romaine Myers, a consulting electrical engineer of Oakland, California, has returned to his offices after an extended tour of hydroelectric investigation in the high Sierras.

Gerard B. Rosenblat, head of the mining section of the Westinghouse Electric & Manufacturing Company with headquarters at Salt Lake City, is a San Francisco visitor.

Leonard F. Fuller, chief electrical engineer of the Federal Telegraph Co., San Francisco, has been recommended for transfer to the grade of member in the American Institute of Electrical Engineers.

C. A. Palmer, formerly with the Public Service Corporation of New Jersey, has joined the sales force of the railway department of the Westinghouse Electric & Manufacturing Company in San Francisco.

E. C. Gribble, who was chief electrician with the Palace Hotel Company of San Francisco for over twenty years, recently resigned to join with W. A. Gribble, his brother, in the Electrical Specialty Co. of San Francisco.

Major John Coffee Hays, formerly president of the Mount Whitney Power & Electric Company in the San Joaquin valley, California, is in charge of the newly created utilities department at Camp Lewis, Washington.

W. L. McKinley, commercial agent of the Sierra and San Francisco Power Co., after an absence of several weeks in Georgia where he went to settle up an estate recently left to him, has returned again to his duties in San Francisco.

J. H. Moseley, advertising manager of the Texas Utility Company and formerly associated with the advertising department of the Journal of Electricity, is now first lieutenant at the second officers' training camp at the Presidio in San Francisco.

R. E. Frickey has resigned as electrical engineer for Northern California Power Co., effective Nov. 1, 1917, but has made no definite announcement of his plans for the future. L. H. Kistler succeeds Mr. Frickey as electrical engineer for the Northern California Power Co.

Waldo C. Cole, of the Westinghouse Electric & Manufacturing Company at San Francisco, will hereafter devote the major portion of his time to industrial investigations for the company. H. C. Hopkins of East Pittsburgh will assume Mr. Cole's former activities with the company.

Simon Bamberger, Governor of Utah, who has done so much for the upbuilding of the electrical industry in that state, attended the recent gathering in San Diego for the formation of a League of Southwestern states and returning up the coast, spent several days in San Francisco.

G. Porter, chief engineer of the British Columbia Electric Railway Company, has severed his connection with that company and is entering business for himself. Mr. George Kidd, on behalf of the officials, presented Mr. Porter with a very handsome gilt French clock and wished him every success in his new venture.

H. M. Byllesby and Samuel Kahn were re-elected president and vice-president, respectively, at the annual meeting of the Western States Gas & Electric Company. Allen L. Chickering was re-elected secretary and general counsel. F. G. Gordon, Elmer Dover, O. E. Osthoff, and J. J. O'Brien were re-elected on the directorate.

H. J. Kammerer, chief electrician of the California and Hawaiian refinery at Crockett, Cal., has tendered his resignation to the company with which he has been connected for so many years. It will take effect on January 1, 1918, and it is announced that he will depart shortly after that date for Hawaii where he will make his future home.

Roy B. Woolley, formerly sales and advertising manager, Standard Electric Stove Company, Toledo, and late of the American Ambulance Field Service at the Verdun front in France, having served his enlistment, has returned to America. He is now with The Society for Electrical Development, New York, as an executive in its advertising department.

John G. Galloway, a noted consulting engineer of San Francisco, has been called into active service as a major in

the United States Engineer Corps. Mr. Galloway is now in the East and it is anticipated that he will see early service in France. As an engineer on the Pacific Coast, Mr. Galloway has long been active. Among other notable achievements he was the consulting engineer for the building of the famous Carquinez Crossing of power lines for the Pacific Gas & Electric Company near Benicia, California, which, though constructed ten years ago, is still the longest single span of wire in the world. In recent months, Mr. Galloway has been an active figure in organizing



local military and defensive effort. As chairman of the committee on inventions for the State Council of Defense, he has rendered able and effective service to the government. His many friends throughout the West wish him godspeed in his active service for the cause of democracy.

George A. Schneider, formerly power apparatus specialist at the San Francisco office of the Western Electric Company,



has left for the East to assume charge of the Buffalo office of the company. Mr. Schneider's promotion comes in recognition of valuable services rendered not only to the company he has served so faithfully but to the electrical industry as a whole. His series of articles contributed to the columns of the Journal of Electricity during the past year under the heading of "Suggestions for Electrical Contractor and Dealer" has been widely

read by men of the industry and the discussions and interest that followed have been of high order. Men of the West will miss his helpful presence, but his going will be still another factor in helping to spread the gospel of co-operation among electrical contractors and dealers in Eastern centers now so widespread in the West.

P. T. Curtin, chief electrician at the plant of the Great Western Electro-Chemical Company at Martinez, Cal., left recently for San Francisco, where he will endeavor to regain his health. He has been closely confined with his labors for the past few months and fears that he is near the point of nervous collapse. He expects to be absent a month or six weeks.

Louis D. Eckard, who for some months has been engaged as superintendent of construction of a copper mine in Alaska, has recently been appointed assistant general manager of the Alaskan Light, Heat & Power Company, with offices at Seattle. Mr. Eckard before going to Alaska was connected with the Philadelphia Electric Company in the distribution and station construction department.

H. S. Haley, member of the firm of Leland and Haley, consulting mechanical and electrical engineers, San Francisco, Cal., is at present at the Llewellyn Iron Works, Los Angeles, in the interest of the U. S. Shipping Board Emergency Fleet Corporation, on one of the largest marine engine and boiler contracts placed on the Pacific Coast. Mr. Haley still retains his interest in the firm of Leland and Haley.

Lesslie R. Coffin of Bellingham, Wash., manager of the Whatcom County Division of the Puget Sound Traction, Light & Power Company since 1910, has been ordered to report for duty at the American International Shipbuilding office in Philadelphia of which Charles A. Stone, president of Stone & Webster is also the head. This company is engaged in constructing \$300,000,000 worth of ships under government supervision for war trade.

John L. Harper, chief engineer of the Hydraulic Power Company and the Cliff Electrical Distribution Company of Niagara Falls, N. Y., is a recent Portland visitor. Mr. Harper has visited or will visit on his trip nearly all of the important hydraulic power plants in the United States, and is making a thorough inspection of all he visits. While in Portland he carefully went over the plants of the Northwestern Electric Company and the Portland Railway, Light & Power Company.

Major J. B. Allison, U. S. A.; **Lieutenant Colonel Clark**, U. S. A., and **Major A. H. Griswold**, U. S. R., were the complimented guests at a dinner given by officials of the company at the St. Francis Hotel, San Francisco, on the evening of

October 18, prior to the meeting of the Telephone Society of the Pacific Telephone & Telegraph Company. Those present, in addition to the above officers, were: G. E. McFarland, J. C. Nowell, H. D. Pillsbury, J. P. Downs, P. H. Coolidge, F. C. Phelps, C. W. Burkett, B. C. Carroll and Major D. P. Fullerton.

Chas. H. Delany, steam power plant specialist of the Pacific Gas & Electric Company, has left for New York City where he will represent the San Francisco Section of the American Society of Mechanical Engineers at the annual meeting in New York. At the hearing of the Power Test Standardization Committee immediately following the annual gathering Mr. Delany, at the invitation of the committee, has consented to present a paper on Standardization of Boiler Tests for Fuel Oil Practice, under the joint authorship of himself and Robert Sibley, editor of the Journal of Electricity.

Andrew M. Buck, power house operator for the Surf Inlet Power Co. of Surf Inlet, B. C.; **Edwin S. Healy**, resident engineer of the Pacific Power & Light Co. of Portland, Ore.; **Kenichi Kubo**, assistant engineer of the Inawashiro Hydro Electric Power Co., Tokyo, Japan; **Arno A. Rohde**, electrical engineer for the Lehigh Portland Cement Co., Metaline Falls, Wash.; **Jay L. Standard**, consulting civil engineer, Portland, Ore.; **A. L. Strickland**, city electrician, Ashland, Ore.; and **Bertram Wood**, electrical engineer, Electrolytic Zinc Co., Hobart, Tasmania, have been elected associate members of the American Institute of Electrical Engineers.

Charles B. Hopkins has recently been appointed postmaster of Spokane. Men of the industry will be interested in the following item which appeared in the Spokesman-Review on October 19 under heading "Twenty Years Ago Today": "Charles B. Hopkins was appointed postmaster at Spokane to succeed H. T. Mallon. The selection of Mr. Hopkins for the position is no surprise to the residents of Spokane, as it has been generally understood ever since the election that he was to be named for the position. Mr. Hopkins is manager of the Inland Telephone and Telegraph Company and is now at Heppner, Ore., on business for the company."

S. F. Forbes, former manager of the Los Angeles office of Fairbanks, Morse & Co., was, on October 1st, made the Pacific Coast Manager for the company, having jurisdiction over the San Francisco, Portland, Seattle, Spokane and Los Angeles offices. The territory covered by these offices includes all of California, Arizona, Nevada, Oregon, Washington, Alaska, the Hawaiian Islands, northern Idaho and western Montana. Baja California, Sinaloa and Sonora are also covered from the Los Angeles office. Mr. Forbes came to Los Angeles from the east, January 1, 1915, as local manager. Since that time he has become closely affiliated with the business interests of the city, and of the southwest. As a director of the Chamber of Mines and Oil, he has contributed valuable suggestions and service to the mining and oil industries. Mr. Forbes expects to make Los Angeles his headquarters. His successor as local manager has not yet been named.

OBITUARY

E. L. Clyne, superintendent of construction of the Denver Gas & Electric Light Company, died at his home in that city on September 16. He was 55 years of age.

John M. Winslow, one of the pioneer telephone builders of the State of Washington, recently died at his country home near Silver Lake, at the age of sixty-one years. Mr. Winslow was born in Philadelphia. As a civil engineer he was engaged for a number of years in Mexico. Going to the Pacific Northwest, he settled in Tacoma, and fifteen years ago he went to Seattle to reside. He held the position of secretary-treasurer of the Puget Sound Telephone Company and was active in the company's affairs up to the time of his death.

MEETING NOTICES FOR ELECTRICAL MEN

(History has been made by men of the electrical industry of the West during the past semi-monthly period. Never before has such a unanimous spirit of willingness to put the shoulder to the helm existed among all branches of the industry. Most important among the meetings that have taken place are those of the San Francisco Electrical Development and Jovian League as set forth in the following lines. Other interesting items on meetings follow.—The Editor.)

Joint Meeting of the Portland Sections of the A. I. E. E. and N. E. L. A.

The first meeting of the season was held at the Multnomah Hotel Portland, Tuesday evening, November 6, 1917.

Sergeant-Major Kenning, of the British Recruiting Mission, was to have given a talk on his personal experiences in the trenches, but was unable to appear. His place on the program was taken by Capt. Palmer of the U. S. Army, who gave a brief outline of the movements of the European armies in the present war. He went into detail and explained several points of military strategy. His talk was very much appreciated by every one present as the Captain thoroughly understood his subject and had the ability to make his explanation very easy for the layman to follow. Mr. C. L. Wernicke presided as chairman. Refreshments were served after the meeting.

During this year, it is going to be the policy of the program committee to make all of the talks of a more popular nature, avoiding strictly technical papers as much as possible unless they are presented in manner and style which will grip the attention of all the members.

Preston S. Millar, general manager of the Electric Testing Laboratories of New York and past president of the Illuminating Engineering Society, addressed the second meeting of the season, that of Nov. 20, 1917. His subject was "Illuminating Aspects of Street Lighting."

San Francisco Section, A. I. E. E.

The meeting of the San Francisco Section of the A. I. E. E. on Nov. 23rd held ample repayment for those attending, in the address of City Engineer M. M. O'Shaughnessy on the Hetch Hetchy development, illustrated by stereopticon views, showing the progress of the work. His talk outlined the development already accomplished and told of the plans which San Francisco will follow in the ultimate production of over 200,000 horsepower of hydro-electric energy and the transportation to the bay region of 400 million gallons of water per day. Mr. P. J. Ost gave the details of construction of the preliminary work, and the methods of obtaining power for carrying the project to completion.

The Telephone and Telegraph Society of the Pacific Coast

The Telephone and Telegraph Society of the Pacific Coast met Thursday evening, November 22, 1917, at Elks Club in San Francisco. The speaker was Sergeant J. Mitchell, of the Seventy-second Canadian Infantry—the "Seaforth Highlanders."

Sergeant Mitchell has lately returned from active service

with the famous Canadian troops who are making history on the western front. He gave a more intimate picture of the activities of trench fighting and barbarian atrocities than can possibly be obtained from our usual sources of information and exhibited a number of trophies gathered from the battlefields. The program was extremely interesting and entertaining.

Los Angeles Section, A. I. E. E.

A meeting of the Los Angeles Section of the A. I. E. E. was held on Nov. 13, 1917, at the Angelus Hotel. L. A.

Gary, switchboard engineer of the Southern California Telephone Company, gave the address of the evening on the subject "Plan of Organization of the Pacific Telephone and Telegraph Company." The December meeting to be held on Dec. 11th will be in charge of H. H. Cox and will cover the subject "Four Years Operation of the Big Creek System."

Spokane Section, A. I. E. E.

The December meeting of the Spokane Section of the A. I. E. E. will be held on Dec. 21, 1917 and will be devoted to a discussion of the subject of the Transmission of Electricity, particularly the Corona of Transmission lines. The committee in charge are: C. S. Covey, chairman, H. V. Carpenter, E. L. Blaine, M. W. Birkett and G. H. Hoppin.

California Electric Railways Association

The California Electric Railways Association recently elected officers for the ensuing year as follows: President, W. Clayton, vice-president and managing director, San Diego Electric Railway Company, San Diego, Cal.; vice-president, Paul Shoup, president Pacific Electric Railway Company, Los Angeles, Cal.; treasurer, the Anglo & London Paris National Bank, San Francisco. W. V. Hill, 58 Sutter street, San Francisco, is manager of the association.

Los Angeles Jovian Electric League

A talk on "The Darkest Days in History," dealing with conditions in Turkey, was made at the Nov. 7 meeting of the Los Angeles Jovian Electric League by J. P. McNaughton, who has just returned to this country after residing in Turkey for twenty-eight years.

On Nov. 14th Sergeant C. Raynor of the 16th Canadian Scottish Battalion was the speaker of the day. Songs by Miss Jane Waller added greatly to the entertainment.

A League of the Southwestern States

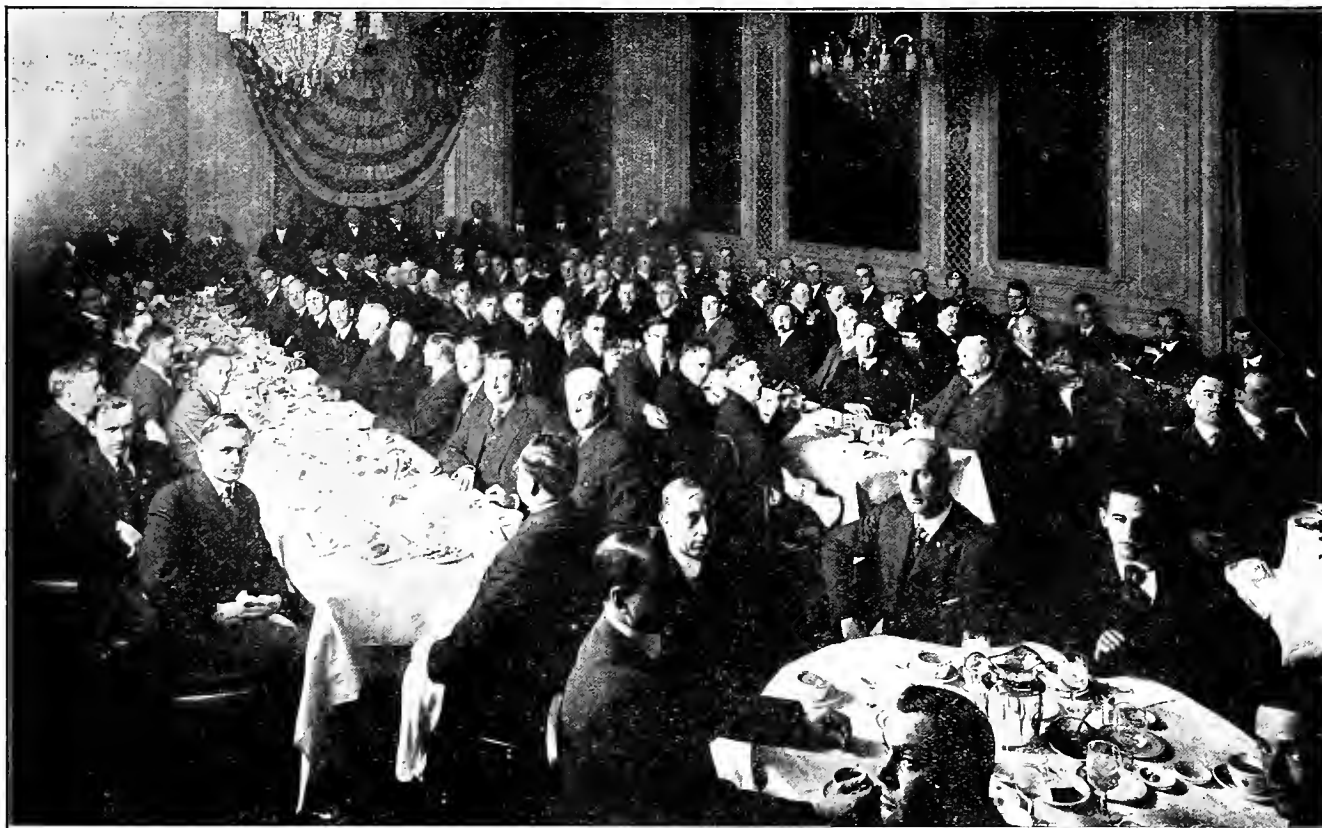
The initial congress of the League of the Southwest was brought together in San Diego on Nov. 14, 1917, to discuss the feasibility of forming a permanent league to further the commercial, educational, artistic and technical interests

BUILDERS OF THE WEST XVIII



CHARLES WATSON BURKETT

The close touch with which men of a vast empire are constantly kept with each other due to the excellent conveniences of the telephone has been a factor, inconceivable in its importance, for the development of the great West. To Charles Watson Burkett, chief engineer of the Pacific Telephone & Telegraph Company, this issue of the Journal of Electricity is affectionately dedicated for, like his great chieftains—Alexander Graham Bell and Theodore N. Vail—he has helped to make neighbors of a hundred million people.



MASS MEETING OF ELECTRICAL MEN AT PALACE HOTEL IN SAN FRANCISCO

Here is one of the most important gatherings of men of the electrical industry in the West during the current year. The San Francisco Electrical Development and Jovian League, acting as hosts for the California Railroad Commission has convened this highly representative gathering to discuss how the best co-operation may be brought about to aid the national government in winning the war. In the audience are men prominent in every branch of the industry. At the speakers' table in the rear, the men standing are (from left to right):

Emerson Hoar, electrical engineer for the Railroad Commission; S. J. Lisberger, engineer of distribution for the Pacific Gas & Electric Company; W. M. Deming, business manager Journal of

Electricity; W. W. Briggs, general agent Great Western Power Company; L. H. Newbert, commercial department Pacific Gas & Electric Company; Albert H. Elliot, secretary Pacific Coast Supply Jobbers' Association and chairman of the day; Robert Sibley, Editor Journal of Electricity and president of the League; Max Thelen, president of the California Railroad Commission and speaker of the day; J. E. Woodbridge, chief engineer Sierra & San Francisco Power Company and chairman engineering committee of Pacific Coast Section N. E. L. A.; Col. H. D. Loveland, California Railroad Commission; Dr. Thomas Addison, western manager General Electric Company; R. M. Alvord, western supply manager General Electric Company; and W. S. Berry, western salesmanager Western Electric Company.

of the southwestern states. Governors of states, mayors of cities and representatives of the allied governments as well as others of prominence were present.

Dr. R. B. von Kleinsmid, president of the University of Arizona, was elected president of the League.

Oregon Society of Engineers

At a meeting held Nov. 15, 1917 at the Central Library, Portland, A. L. Wilbur, Commissioner of Public Works of Portland, Ore., addressed the Oregon Society of Engineers on the subject of "The need for a complete cost keeping system in City Departments." He contended that real efficiency can only be secured when cost of production is accurately known, and his discussion covered general contract work as well as municipally owned and operated plants as represented by the proposed city paving plant.

The Pacific Service Employees Association

The Third Annual Show of the Pacific Service Employees Association will be held on December 6th, at the Scottish Rite Auditorium. The show will be of a Christmas and patriotic nature and will be given almost entirely by employees of the Pacific Gas and Electric Company. A chorus of fifty voices will render Christmas carols and an orchestra of twenty pieces will furnish the instrumental music. A Christmas play entitled "Miss Civilization" will be given by members of the association. The Pacific Service Employees Association has a membership of approximately one thousand, the officers being Henry Bostwick, chairman; Geo. B. Furniss, vice-chairman, and R. W. Robinson, secretary.

A. S. M. E. Annual Meeting

Never was an annual meeting of this society planned which more thoroughly voiced the spirit of the times and more fully interpreted the current problems of the engineer than will the coming annual meeting. Interest will center at once in the opening session on Tuesday evening, December 4, the occasion being the conferring of honorary membership upon Maj.-Gen. George W. Goethals, with an address by Hon. William H. Taft, ex-President of the United States.

The topic which is uppermost in the minds of every one—the war—will constitute the basis for the keynote session which is to take the entire day, Wednesday. The subject is to be broadly interpreted from the standpoint of the service which the engineer can render to his country in times of crisis, whether of war or peace.

The presidential address by Dr. Ira N. Hollis will be given at this session, on Universal Public Service in Peace and War. Other addresses will follow on more specific problems relating to the work of the engineer in agriculture; transportation by rail and road, water and air; education and research. The other sessions will be equally interesting and important.

San Francisco Electrical Development and Jovian League

At the Nov. 7 meeting of this society, instead of the usual speaker of the day, four speakers gave very brief talks, two on "Co-operation," the third on "How to Play Safe," and the fourth on "What the Inspector Expects." The speakers were C. G. Hardy, city electrician of Oakland; Arthur Kemp-

ston, city electrician of San Francisco; John R. Brownell, superintendent of safety, State Accident Commission, and Robert L. Eltringham, safety engineer, State Accident Commission.

On November 14, the subject of building up friendly engineering and commercial relations with the Orient was undertaken for discussion. G. I. Kinney of the General Electric Company as chairman of the day introduced in turn Mr. Harushara, consul general of Japan, John Clausen, vice-president of the Crocker National Bank and manager of the Foreign Exchange Department, H. R. Hatfield, dean of the College of Commerce and acting president of the University of California, and E. W. Wilson, vice-president of the Anglo London Paris National Bank and vice-president of the Foreign Trade League. After most interesting talks from these gentlemen the resolutions set forth on the front cover of this issue of the Journal of Electricity were unanimously carried.

An exceptionally large attendance graced the meeting of the League with the Railroad Commission as guests, held at the Palace Hotel on Nov. 19. The meeting was opened with a statement by each person present of the work being done by his company to assist the government.

Albert H. Elliot, acting as chairman, spoke of government by commission as a twentieth century method. Progress has brought out problems of especial public interest, and

it is to meet these problems that the commissions with their experts have been evolved.

Max Thelen, president of the Railroad Commission, stated that now was an opportune time for engineers of the electrical industry to ask themselves, "What can we do?" An interconnection of the various hydroelectric plants can be made to conserve fuel by a more complete use of available water power. We can eliminate all unnecessary use of electricity and we can develop new sites, but this is a slow process. Something must be done for the margin of reserve power is very little, and a shortage of electrical apparatus is imminent. His suggestion of a committee to make a survey of what can be done was followed by the unanimous passing of the resolution set forth in full on the editorial page.

Emerson Hoar, electrical engineer for the commission, and J. E. Woodbridge of the N. E. L. A. and chief engineer of the Sierra & San Francisco Power Company, emphasized the scarcity of fuel oil and the danger of a serious shortage due to the present consumption of one million barrels per month more than the production. The support of the Railroad Commission in all efforts for advance was promised by Col. Loveland, and a unity of action requested by Dr. Thomas Addison of the General Electric Company, in the matter of supplying the pressing need of electric motors in oil production.

HAPPENINGS IN THE INDUSTRY

Changes and Beginnings

The Richland Telephone Company of Richland, Wash., has sold out to the Kennewick Valley Telephone Company.

The San Joaquin Light and Power Corporation's shares are now listed on the San Francisco Stock and Bond Exchange.

The Baker-Joslyn Company has been appointed Pacific Coast Distributors for the V. V. Fittings Company and will carry adequate stocks of the "V. V." line at their three warehouses.

F. A. Bauman & Company of Portland, Oregon, have established their new location at 250 Stark street, near the corner of Third, and will maintain a modern and up-to-date retail electrical store.

The Ward Leonard Electric Company of Mount Vernon, N. Y., manufacturer of electric controlling devices and vitreous enamel insulation resistance units, announces that it is now represented in San Francisco by the Electric Material Company, 589 Howard street.

The Badt-Westburg Electric Company, of Chicago, who handle the Ward Leonard Electric Company's line of electric controlling devices and vitreous enamel insulation resistance units, announces a change in the corporate name to Westburg Engineering Company. This involves no change in the management.

On October 1, 1917, the New York sales office of the Edison Storage Battery Company, long located at 206 W. 76th Street, moved into larger quarters, at 209 West 76th Street, right across the street from the old headquarters. At the new location many additional facilities have been installed to enable the manager, Mr. John Kelly, to take care of the increased business and to give every customer the usual Edison service.

In addition to its district sales offices now located at New York, Boston, Philadelphia, Pittsburgh, Chicago, St. Louis, Denver, San Francisco, Seattle, Dallas, Atlanta, and Detroit, The Youngstown Sheet & Tube Company has opened a branch in the Munsey Building, Washington, D. C. This office will be in charge of Mr. W. B. Blowers, District Sales

Agent, assisted by Mr. H. E. Richardson, who has been transferred from the Philadelphia office and who will reside in Washington.

New Power Loads

During the month the town of Union Gap granted the Pacific Power & Light Company a 50-year franchise. The town of White Salmon has signed a 10-year street lighting contract.

During the week ended November 3rd the Eureka division of Western States Gas & Electric Company secured contract with the California Central Creamery for the power requirements of their new plant at Arcata. The Rolph Ship Yards are being supplied an additional 40 horsepower in motors. The Western States Company is now negotiating with the Arcata Barrel factory for the power requirements of their new factory, estimated at 150 horsepower.

The No. 5 boat of the Natomas Dredging Company of Stockton, California, which is operated electrically through energy supplied by the Western States Gas & Electric Company, has been placed in operation after having been out of commission for six or seven months.

The Union Iron Works is to construct 40 torpedo boat destroyers for the United States Government. The engines for these will be built by the General Electric Company at its plant in Erie, Pa.

The Cokedale coal mines in Skagit county, Wash., are to be opened in the immediate future and the mine is to be electrified, a contract having been let to the Puget Sound Traction Light and Power Company, which will build a power line as soon as materials can be secured. A substation will be built at the mine and 500 h.p. will be developed. The Washington Portland Cement Company let the contracts.

New Business

A net gain of 345 electrical customers and 16 gas customers is reported in Portland, together with an additional gain in motors of 650½ h.p.

The F. E. Newbery Company of Los Angeles has contracted to do the electrical work for a bank and office building at 725-729 S. Spring street.

The wind-up of the vacuum cleaner campaign of the Pacific Power & Light Company of Portland scheduled for September shows that 132 machines were sold during this campaign. For the ten months of this year 507 cleaners were sold as compared with 200 for the year 1916.

All previous records for new business sales were broken in Denver last month. Complete figures as to the total business done in October are not yet available, but it is evident that the amount will be more than \$40,000. Sales for the year will run to \$300,000 as against only \$50,000 a few years ago.

Personal Items

Norman B. Hickox has been appointed sales manager of the National X-Ray Reflector Company to succeed Ernest H. Cameron, who has resigned and is now located at Seattle, Wash.

A. C. Cornell, has been house-goods specialist in the St. Louis branch house of the Western Electric Company, has been appointed sales manager of the Denver, Col., branch house of that company.

F. Tresselt, representative of the V.V. Fittings Co., is spending some time on the Pacific Coast with the San Francisco, Los Angeles and Seattle houses of the Baker-Joslyn Co., who are acting as Coast Distributors of the "V. V." line.

C. R. Hunt, of Robbins & Meyers, has returned from a five weeks' visit in the East. Mr. Hunt reports that his company's factory is crowded with orders but that the company is taking care of customers' requirements with remarkable promptness in view of abnormal conditions.

J. D. Holmes, manager at Oakland, is receiving many compliments on the able manner in which he explains the details of "Speeding the Spoken Word," the three-reel motion picture showing an interesting insight into the telephone industry, which is being exhibited before various commercial organizations in the bay cities—Oakland, Alameda, and Berkeley.

H. A. Good, formerly with the San Francisco office of Pacific States Electric Company is now handling outside sales work for the Oakland office of the company. A. A. Elick has charge of the inside work for the Oakland Branch and Geo. G. Drew is sales agent in charge of the Oakland Branch. Mr. Drew reports a nice increase in volume of business right along, on the east side of the bay.

The Philadelphia Storage Battery Company have acquired the services of Walter E. Holland to take charge of research work connected with the manufacture of Philadelphia Diamond Grid Batteries for use in electric pleasure and commercial cars and starting, lighting and ignition systems on gasoline cars. Mr. Holland was for some years Pacific Coast representative of the Walker-Vehicle Company, Chicago, and of the Elwell-Parker Electric Company, Cleveland.

License for Handling Explosives

Any person in the United States found with explosives in his possession after November 15, who does not have a license issued by the Federal Government showing the purpose for which the explosives are to be used, will be at once arrested and fined up to \$5,000 or sent to prison for one year.

The law provides that every one who handles explosives must have a license. The manufacturer, the importer and the exporter must have licenses issued by the Bureau of Mines in Washington. The seller of explosives and the purchaser of explosives must also have licenses, these to be issued generally by county clerks, or other local officers who are authorized to administer oaths. There will be at least one licensing officer in each county, and more agents will be designated if the county is sufficiently large to warrant it.

With the strict enforcement of this law, the Federal authorities hope to prevent explosives falling into the hands of evilly-disposed persons and to put a stop to all further dynamite plots.

All industries requiring explosives should continue until local licenses are issued.

Amalgamation of Large Heating-Device Interests

For some time past it has been generally known in the West, although confirmation was lacking officially, that a gigantic merger of the heating-device interests was in progress. It is now announced that three of the largest manufacturers of domestic electric heating devices have consolidated their interests into one company to be known as the Edison Electric Appliance Company. This company will be organized to acquire the domestic electric heating-device business of the General Electric Company, the Hotpoint Electric Heating Company and the Hughes Electric Heating Company.

The purpose of this amalgamation is to secure a large volume of production of domestic electric heating devices and also more standardized designs. The new company, it is felt by the organizers, will also be able to secure more complete and thorough distribution of its output than could be done by the individual companies acting separately.

The new company will be licensed under the Marsh patent to use nickel-chromium in its resistance units.

W. H. Booth of the Hotpoint company will be chairman of the boards of the new company, and George Hughes of the Hughes company will be president. A. K. Baylor and H. C. Houck of the General Electric Company will be on the board of directors. Mr. Richardson and Percy Booth, both of the Hotpoint company, will be associated with the manufacturing and commercial departments of the new company respectively. An announcement of the capitalization of the new company will be made at a later date.

For the time being the new company will use the factories of the Hotpoint company at Ontario, California, and the Hughes company at Chicago. The domestic heating-device manufactures of the General Electric Company will be moved from Pittsfield, Mass., to the new factories.

Car Fare Raise

The Superior Court of Thurston county, Washington, has sustained the action of the Washington State Public Service Commission, in permitting the Puget Sound Traction Light & Power Company to abolish the four-cent fare in Seattle. Corporation Counsel of Seattle has given notice of appeal.

Preference to Western Coal Shipments

Railroads have been ordered to give priority rights to coal for shipment north and west from the mines of Wyoming and Utah.

Robert S. Lovett, administrative officer under the provisions of the priority shipments act, has issued the following priority order No. 3:

First, That the railroad companies named in subdivision "third" below, serving the coal mines in the Utah and Wyoming coal fields, shall, until further order, supply daily to the mines in the Utah and Wyoming coal fields all or so many of the empty box and single-deck stock cars moving west or north-west over their lines as may be required to transport coal ready for shipment west or northwest, according to the direction in which such cars are being moved.

Second, That the railroad companies named in subdivision "third" below shall so transport or deliver all cars of every kind loaded with commercial coal and destined to points west and northwest of point of shipment, that they shall have preference and priority in shipment, after transporting (a) railroad fuel supply; (b) live stock and perishable freight, including sugar beets; (c) Government shipments; and (d) commodities to and from smelting plants sufficient to keep same in operation.

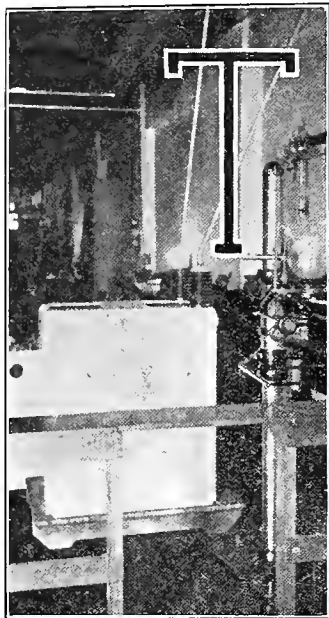
Third. The railroad companies to which this order applies are: Denver & Rio Grande Railroad Co., Los Angeles & Salt Lake Railroad Co., Utah Railway Co., Union Pacific Railroad Co., Oregon Short Line Railroad Co., Southern Pacific Co., Western Pacific Co.

LATEST IN EVERYTHING ELECTRICAL

(The startling picture of the head of a living man shown below is an example of effective X-ray work. The difficulty involved and the way in which it is overcome by a new converter is here pointed out by a research engineer of the Rieber Laboratories. A magnetic pulley used in removing iron from other products and a new induction motor panel are further described.—The Editor.)

NEW DEVELOPMENT OF X RAY APPARATUS

BY C. B. MERRICK



A test of 120,000 volts

THE use of electricity in the medical field has compelled the physician to become more or less of an electrician, and consequently he is to that extent interested in the makeup of the apparatus he uses. On the other hand the electrician has entered the medical field, and a mutual advantage has been attained.

The use of the X-ray machine is now so universal that a statement of the requirements of such a machine may be of interest. The X rays are produced by means of electrical discharges through a vacuum, which necessitates a high electromotive force to produce the discharges. In order to concentrate the rays and prevent injury to the tube

this e.m.f. must be unidirectional, the generation of which at high potentials presents many difficulties. The method employed has been to transform from ordinary a.c. lighting voltage to the potential required, the input to a high tension transformer being controlled by an auto transformer. The output from the high tension transformer was then rectified by an electrolytic or synchronous air rectifier.

One difficulty of this method is the dead points between contacts on the auto transformer, which prevent variation of applied potential during exposure. A series resistance allows for variation during exposure but is unsatisfactory in many ways. It causes poor regulation, the voltage drop varying with the load, so that a no load adjustment previous to exposure cannot be made except by guess. This is exceedingly difficult, as the resistance of the tube varies from time to time, even during the exposure. Exposure tables are made up for a given value of current and uniform results depend largely on the ability of the operator to maintain the current at the value desired. A radiograph of a head taken with an exposure of 110 milliamperes seconds at 75 thousand volts is shown in the cut.

The electrolytic rectifier has a low and variable efficiency on heavy loads, and the synchronous rectifier in air is noisy and generates chlorine gas due to the arc produced.

These difficulties have been overcome in the Rieber Converter by a special auto transformer having no dead points between contacts so the applied voltage can be varied at any time, and the penetration changed even during an exposure. This eliminates the necessity for a common practice of installing a special supply transformer of large capacity exclusively for the use of the converter, and thereby reduces the expense of operation. The high tension secondary has been divided into sections, each section having its individual rectifier. Then by immersing the whole in oil, the size of the parts has been greatly reduced and the noise eliminated. For

the general safety of the operator it is necessary to keep the high tension circuits away from the control apparatus. Even the milliammeter which measures directly the current in the tube circuit can be handled with safety.

Consistent dependable service has become a necessity. Assurance of uniform operation under all conditions is obtained by thorough factory tests on each machine before it is



ROENTGENOGRAM OF A SKULL

Here is a picture of a man's head taken by means of the improved X-ray apparatus, using a 110 milliamperes second exposure at 75,000 volts.

put into service. This consists of preliminary tests upon all the constituent parts, and a final complete test upon the assembled unit. The photograph shows a converter undergoing the final test of continuous operation for two hours at 120,000 volts. This allows a wide margin of reserve, as actual operating conditions seldom impose a more severe demand upon the machine than 100,000 volts for a few seconds.

MAGNETIC PULLEYS USED IN MANY INDUSTRIES

The use of magnetic separator pulleys has increased to a great extent during the past few years. For example, they are used with success in removing pickheads, coupling pins, etc., from coal passing to a crusher which would be damaged by the entrance of such material. They are used for similar purposes at phosphate rock mines and quarries. In the production of sulphite fibre paper stock, they are used to remove tramp iron and steel from the wood chips before these are delivered to the sulphate tanks. They are also used in the production of cement, gypsum, limestone, clay for terra cotta manufacture, as well as in the freeing of grain, spices and tobacco from bits of iron or steel before grinding. They also find employment in city refuse disposal plants, for removing

tin cans, horse shoes, nails, etc., from the worthless material. The high cost of metals has made the saving of metal turnings and separation of iron and steel from brass well worth while.

The magnetizing of the pulley is accomplished by means of passing direct current through windings in the interior of the pulley. The current sets up a magnetic flux which passes through the belt, and attracts any iron or steel contained in the material carried by the belt. As a result these pieces are



Exploded view of magnetic pulley

held in contact with the belt until the latter leaves the pulley underneath. Here they are dropped and collected in a box or kept separate (by means of a barrier) from the other material which is projected beyond the pulley. The disposal of the materials is cared for according to the amount and kind of product handled.

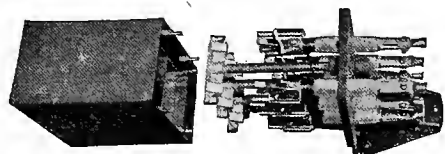
Direct current is required to energize the magnetic separator pulley when in operation. Only a small amount of current is required, the average for sizes in greatest use being but a few amperes. Standard pulleys can be connected therefore to any 110 or 220-volt direct current electric system, although pulleys may be designed with coils suitable for operation on 500-volt direct current circuits.

INDUCTION MOTOR CONTROL PANELS

Where it is desired to combine in one unit the complete control equipment for wound-rotor induction motors, a neat, safe and convenient means either for starting or for speed variation, is provided by Type RF control panels, manufactured by the Westinghouse Electric & Mfg. Company of East Pittsburgh, Pa. By their use motors are provided with complete protection from injury due to overloads, failure of voltage and improper starting. Panels are suited to all applications where drum controllers may be employed.

Each outfit consists of a pipe-mounting slate panel on which is mounted an oil circuit-breaker for the primary circuit; a drum controller for the secondary circuit; and when desired one or more meters mounted on the panel. Resistors are separately mounted.

One of the most interesting features of these panels is an interlock between the oil circuit-breaker and the drum



Improved Induction Motor Control Panels

controller which renders it impossible for the operator to start the motor without all the resistance in the secondary.

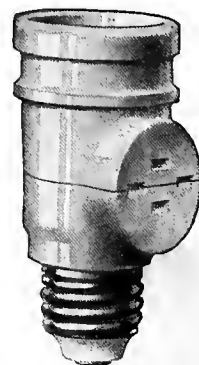
These panels are recommended for service in which reversing is seldom or never required.

SPARTAN PORCELAIN CURRENT TAPS

Often it becomes necessary to provide a connection for fan motor, heating pad, or other current-consuming device in a room where there is no convenient receptacle—and where the electric lamp must be retained at its original location.

For just such conditions, the Spartan Porcelain Current Tap was designed. This device, manufactured by the Bryant Electric Company, of Bridgeport, Conn., is virtually a ready-wired socket adapter with a slotted receptacle in its side, for cap or plug. One end of its body is fitted with standard screw plug—just like a regular lamp base—the other end is designed to receive a standard medium base lamp. Thus a lamp may be removed from its socket, the Spartan Tap put in its place, and the lamp screwed into the outer end of the Tap. It therefore not only provides for the retention of the lamp in its original location but provides a suitable approved receptacle for attachment plug.

This device can be furnished for multiple or series connection.



Current Tap

SUPERIOR COURT SETS ASIDE COMMISSION'S RULING IN RATE CASE

Holding that the public service commission has no jurisdiction over waterworks operated in Dallas by H. V. Gates, the supreme court has handed down an opinion in which the decision of Circuit Judge Kelly is reversed and the order of the commission reducing the rates charged by Gates is set aside. In 1902 the city of Dallas made an agreement with Gates whereby Gates was to build waterworks to cost not less than \$20,000 and the city was to pay him \$12,000 and furnish all rights of way and water permits. Gates was to operate the plant for 20 years, at the end of which the city was to pay an additional sum to be fixed and take over the plant. The Supreme Court holds that the plant is municipally owned and hence the public service commission has no jurisdiction.

COMMITTEE ON ELECTRIC STATION SAFETY ORDERS

Announcement is made by John R. Brownell of the California Industrial Accident Commission that the committee to prepare Electric Station Safety Orders is composed of the following:

League of California Municipalities: R. H. Manahan, City Electrician, City of Los Angeles; Arthur Kempston, Chief, Department of Electricity, City of San Francisco. California Electric Railway Association: Walter T. Bivins, Chief Engineer Electrical Equipment, United Railroads of San Francisco; S. H. Anderson, Electrical Superintendent, Pacific Electric Railway, Los Angeles. State Railroad Commission: F. Emerson Hoar, Gas and Electrical Engineer. Pacific States Telephone & Telegraph Co., R. T. Joslin, Engineering Department. The Western Union Telegraph Co., J. C. Fricke, Postal Telegraph Co., H. C. Shaw, Division Electrical Engineer. Manufacturers of Electrical Equipment: John Hood, Engineer, General Electric Co.; R. F. Behan, Westinghouse Electric & Manufacturing Company. National Electric Light Association, Pacific Coast Section: J. A. Lighthipe, Electrical Engineer, Southern California Edison Co., Los Angeles; J. P. Jollyman, Engineer of Electrical Construction, Pacific Gas & Electric Co.; J. A. Koontz, Electrical Engineer, Great Western Power Company; M. C. McKay, General Superintendent, Sierra & San Francisco Power Company. International Brotherhood of Electrical Workers: Pacific District Council No. 1—President J. Morgenthaler, San Francisco; Linemen's Union and Station Operators' Union No. 151—Harry Book, Henry Boyen; Cable Splicers' Union No. 537—President C. A. Elmore, Oakland.

BOOKS AND BULLETINS FOR ELECTRICAL MEN

Electrical Apparatus

Choke Coils for Alternating Currents are described in Bulletin No. 45060 of the General Electric Company.

An 8-page bulletin gotten out by the General Electric Company bears the title "RF Adjustable Speed Motors."

Hubbell Quick Catch Sockets are the subject of an eight page pamphlet issued by Harvey Hubbell, Inc., of Bridgeport, Conn.

Bulletin No. 45505, a 12-page booklet issued by the General Electric Company, describes and lists Induction Voltage Regulators.

Portable Instrument Transformers of types P2 and R2 form the subject matter of Bulletin No. 46030 of the General Electric Company.

An attractive 55-page bulletin of Electrical Specialties has been recently given to the trade by the Chelton Electric Company of Philadelphia.

"Motor Driven Exhaust Fan Outfits" are described in a 14-page bulletin (No. 41801) recently given to the trade by the General Electric Company.

The General Electric Company has published its index to Supply Part Bulletins as well as a second which covers Descriptive Bulletins and Sheets.

Bulletin No. 1D of the Crouse-Hinds Company of Syracuse, N. Y., is entitled "Safety Panels and Cabinets" and includes descriptions and price lists.

A change in the Standard length of chain on P&S Pull Sockets and Receptacles is announced by Pass and Seymour. Hereafter the chains on all such sockets are to be 8 inches unless otherwise specified.

The Cutler-Hammer Mfg. Company of Milwaukee, has just published a one hundred page booklet containing reproductions of letters received from motorists giving opinions on the C-H Magnetic Shift. The letters are photographically reproduced and are interesting in that they indicate a well defined liking for pre-selection of speeds as provided by the Magnetic Shift, by the motor car driver.

A 28 page revised bulletin on Type D.O.A. Outdoor Cable Terminals has just been issued by the Standard Underground Cable Co. in which several new types of terminals are described and listed. Among these are the Protected Disconnection Terminal, Pipe-Top Terminal and Borehole Terminal. The bulletin gives tables of working voltages and sizes of conductors for which terminals of certain dimensions and weights are required, also instructions for ordering, installing, etc.

Coal and Mining Bulletins

A recently published circular lists the publications of the West Virginia Geological Survey, covering such subjects as Coal, Petroleum and Natural Gas.

"Control of Hookworm Infection at the Deep Gold Mines of the Mother Lode, California," by Dr. James G. Cumming and Joseph H. White, is the title of Bulletin 139 of the Bureau of Mines.

"The Effect of Low Temperature Oxidation on the Hydrogen in Coal and the Change in the Weight of Coal on Drying" is the title of Technical Paper 98 of the Bureau of Mines, gotten out by S. H. Katz and H. C. Porter.

The Committee on Coal Conservation of the Chamber of Commerce of the United States has addressed Bulletin No. 2 to the Owners and Managers of Power Plants with suggestions as to how coal may effectively be conserved.

Bulletin 136 from the Bureau of Mines covers the subject of the "Deterioration in the Heating Value of Coal during Storage," being the result of a series of tests conducted under the supervision of Horace C. Porter and F. K. Poitz.

A recent bulletin gotten out by J. K. Clement and J. N. Lawrence under the Bureau of Mines covers the subject of

"Laboratory Determination of the Explosibility of Coal Dust and Air Mixtures." It is listed as Technical Paper 141.

The California State Mining Bureau has issued a series of reports on the Mines and Mineral Resources of the various counties of California, the separate booklets representing chapters of the State Mineralogist's report of 1915-1916.

Bulletin 138 of the Bureau of Mines is entitled "Coking of Illinois Coals" and covers the various factors involved in the process and a general discussion of tests which were carried out by the Illinois State Geological Survey and the department of mining engineering of the University of Illinois.

Annual Reports and Price Lists

The bound volume of the annual report of the Board of Supervising Engineers of Chicago Traction covering the period ended January 31, 1914, has recently been given to the public.

A complete classified list of publications for 1917-1918 has recently been gotten out by J. B. Lippincott Company of Philadelphia.

A classified list of books has been gotten out by Longmans, Green and Co. of New York.

Additions and changes in retail price lists are the subject of a recent pamphlet issued by Boorum and Pease Company of New York City.

Upbuilding the Electrical Industry

Circular No. 68 of the Bureau of Standards covers the subject of "Public Utility Service Standards of Quality and Safety." The National Electric Safety Code and electrolysis mitigation are two of the subjects covered.

The Underwriters' Laboratories of the National Board of Fire Underwriters have issued an October supplement to the List of Inspected Electrical Appliances.

"The Vital Relation of Insurance to Banking and Shipping in the World's Trade after the War" is the subject of a pamphlet by Henry Evans addressed to bankers, capitalists, shippers and producers.

A circular on Holiday Business with suggested advertisements has been gotten out for the trade by the Hotpoint Electric Heating Company.

In response to the growing demand for information concerning the flood control works to be built by the Miami Conservancy District, Dayton, Ohio, and concerning the results of the investigations conducted by its engineering staff, a series of Technical Reports describing the development of the project and all features and investigations of importance are being printed.

BOOK REVIEWS

Practical Electricity

by Terrell Croft, consulting electrical engineer; size 6 x 9 in.; 646 pp.; published by the McGraw-Hill Book Company of New York City and for sale by the Technical Book Shop, San Francisco. Price \$2.50.

An excellent textbook for a man of little previous training or a book of review for more advanced students wishing to refresh their memories on electricity is to be found in Mr. Croft's book. No abstruse mathematical formulas or theories are involved; if a man understands arithmetic the subject matter of the text should be clear to him. Formulas and mathematical charts, although simple, however, are technically correct. The elements of theory and practice of electric and magnetic phenomena are here clearly presented. Wherever possible, familiar analogies have been employed. Illustrations are profuse and well explained. The book should be understood by high school students—in its comprehensiveness it might well serve as a textbook for a beginning college course.

NEW ELECTRICAL DEVELOPMENTS

(The announcement of a gigantic project to utilize the waters of the upper Kings River for power generation is perhaps the most important news of the week. The power that will be eventually developed, according to present plans of the corporation's engineers, will amount to more than 100,000 horsepower. Plans for a large sawmill are being pushed in Oregon and farm activities along electric lines continue to be reported from the central valleys of California.—The Editor.)

THE PACIFIC NORTHWEST

SEATTLE, WASH.—The contract for furnishing transformers to the city lighting department has been awarded to W. R. Hendry & Company, at \$55,778.94.

SALEM, ORE.—An application asking for permission to revise rates on electricity has been filed with the public service commission by the Bandon Power Company.

OLYMPIA, WASH.—Bids will be received up to Dec. 1, 1917, for construction of a cottage and power house at the state school for girls at Grand Mound, Washington.

DELTA, B. C.—The municipal council of Delta, B. C., have under consideration the installation of an electric pump in connection with the East Delta dyking and drainage system.

SNOHOMISH, WASH.—An election will be held Dec. 4th at which the people will vote on the installing of two 20 horsepower electrical pumps with a capacity of 11,000 gallons a minute.

NEW WESTMINSTER, B. C.—The city council of New Westminster has closed a contract with the Western Canada Power Company for a supply of power and light at the Poplar Island shipyard.

SKYKOMISH, WASH.—The town council has accepted the bid of the State Board of Finance for the \$7,000 bond issue to be used in acquiring and constructing a municipal light and power plant.

EUGENE, ORE.—The Portland office of NePage, McKenny Company has been awarded the contract for the electric wiring in the Medical School of the University of Oregon at this place at \$5444

VANCOUVER, B. C.—The contract for electrical work at the Wallace Shipyards Company's foundry on Industrial Island has been awarded to Mundy, Rowland & Company, Standard Building, Vancouver.

SEATTLE, WASH.—Meacham & Babcock have agreed to build the Ballard Extension of the municipal car line for \$117,000. Harry Whitey Treat has offered to sell his Loyal Heights line to the city for \$70,000.

SHELTON, WASH.—The Shelton Light and Power Company recently applied to the Mason county commissioners for a 25 year franchise to construct and operate transmission lines from their plant on Goldsborough Creek.

PASCO, WASH.—A municipal ownership league has been formed here, with the idea of settling the water system question permanently. It has been proposed to purchase the Pacific Power & Light plant, but they cannot come to terms.

AUBURN, WASH.—The council has under consideration the granting of a franchise to the Valley Gas Company to manufacture and sell electric current for light and power purposes in Auburn. Action has been postponed for two weeks.

SEATTLE, WASH.—John E. Price & Co. will accept delivery of the \$390,000 light extension bonds of date of October 1, under an agreement reached by Corporation Counsel Hugh M. Caldwell and Bruce Shorts, Seattle representatives of Caldwell & Masslich of New York.

STAYTON, ORE.—At a recent meeting of the city council a franchise of city property was granted the proposed new railroad. An electric power right was also given for a term of 50 years. It is said the road will be operated by steam for a time, but later will be electrified.

VANCOUVER, WASH.—The Northwestern Electric Company has secured a franchise to endure for 50 years for all the country roads and streets outside incorporated cities and towns in different portions of the county. The company intends to supply current to the farmers in the district and industries near Camas for lights and power.

SEATTLE, WASH.—J. L. Stannard, engineer who has been retained to ascertain the feasibility of a power plant along the Cedar River between Landsburg and Cedar Falls, has made his report on four projects as follows: Plan A, 9.4 miles, \$2,390,630; Plan B, 12.2 miles, \$2,653,950; Plan C, 9 miles, \$2,242,300; Plan D, 8.5 miles, \$1,919,300.

SEATTLE, WASH.—Council passes resolution directing the city comptroller to receive subscriptions in an amount up to \$40,000 for bonds of the municipal railway for building the Ballard extension. These bonds have already been some \$12,000 oversubscribed. The request for an injunction against construction of the road was denied and work will proceed.

ASTORIA, ORE.—The Pacific Power & Light Company, because of an increase in business in the vicinity of the Port of Astoria terminals, asks the city for permission to erect a small substation on Taylor avenue at the intersection with the Port thoroughfare. The substation will be 12 by 17 feet. The station will provide power for the Port terminals, shipyards in the vicinity, and other industries now contemplated.

PORTLAND, ORE.—An electric lighting system for Mount Tabor Park may be donated to the public by a public-spirited citizen, according to whisperings heard by Park Superintendent Keyser. He says he has received information that some one, name unknown, proposes to contribute the \$10,000 necessary to wire the present lighting poles in the park. The city council, in session as a budget committee, cut out all provision for lighting the park next year.

BEND, ORE.—An 80,000 to 100,000 foot capacity sawmill is to be started this winter at Pringle Falls by the Deschutes White Pine Lumber Company. This will be ready for installation of machinery by spring. It is estimated that 2250 h.p. will be developed to start the mill in operation by the beginning of next spring. Later the entire river is to be diverted from its channel through a canal 1000 feet long with an eight foot fall at the end.

NORTH YAKIMA, WASH.—Final details of the plan for installing a pumping plant, to cost about \$200,000, near Prosser for the lifting of water from the Sunnyside canal to water 2000 acres above the gravity flow, were worked out at a meeting of directors of the Prosser irrigation district and R. K. Tiffany, representing the United States reclamation service. The site for the pumping plant has been purchased and as soon as the supreme court passes on the validity of the issue of bonds which the government will take, work on the pump house and distribution system will begin.

KLAMATH FALLS, ORE.—The great dam of the California Oregon Power Company across the Klamath River at Copco, Siskiyou county, California, 45 miles from this city, being completed, the tunnel which carried the waters of the stream during the construction period has been closed. The California Oregon Power Company plans to generate 26,000 horsepower under present development, and an equal amount can be developed by the addition of other units to the power plant. The company plans a smaller dam below the present structure, which will bring the total development to 103,000 horsepower.

THE PACIFIC CENTRAL DISTRICT

COLTON, CAL.—Sealed bids are being taken by the board of trustees for the annual supply of electric lamps.

ST. HELENA, CAL.—The city trustees have advertised for bids on two new schedules for lighting the streets here.

TRACY, CAL.—The West Side Irrigation District has let a contract to the Lindgren Co., San Francisco, for a pumping plant for \$25,789.

PALO ALTO, CAL.—The board of public works has recommended that the council appropriate \$200 for placing lights along the creek from Alma street and Palo Alto avenue to the Slate Highway bridge.

ANGEL CAMP, CAL.—The substation of the Stanislaus and San Francisco Power Company, located at Copperopolis was burned to the ground recently, entailing a loss of \$100,000. An overloaded transformer caused the loss.

PORTOLA, CAL.—Owing to the destruction by fire of the electric-light plant of the Grizzly Electric Company the town is without electrical service. The loss is placed at about \$7,000. The plant, it is understood, will be rebuilt as soon as possible.

FRESNO, CAL.—The board of trustees have granted the petition of the property owners for the formation of a lighting district for the installation of electroliners, to start at G and Fresno North streets to Kearney Boulevard and on the boulevard to the city limits, one-half mile.

MARYSVILLE, CAL.—The Pacific Telephone & Telegraph Company has filed a petition with the State Railroad Commission asking for permission to operate in Marysville, Yuba county, El Paso de Robles, San Luis Obispo county, Stockton, San Joaquin county, and Watsonville, Santa Cruz county.

PERRIS, CAL.—In the Perris and San Jacinto valleys in southern California the area under cultivation has been greatly increased recently by the use of motor-driven pumps which supply water for irrigation. At present approximately 10,000 horsepower in electric motors is being used in these two valleys.

SAN FRANCISCO, CAL.—Receipts of the Municipal Railway are gradually approaching the normal sums reported prior to the strike of the United Railroads platform men. Last week they ranged from \$5965 a day to \$7107. During the height of the strike they exceeded \$11,500 a day and went at times as high as \$12,000.

FRESNO, CAL.—The damage suit of A. L. Dibble against the San Joaquin Light and Power Company has gone to trial in Department Two. Dibble is asking for \$5000, the value of grain in the field alleged by him to have been destroyed by fire through negligence of the power company. George K. Ford of San Francisco is representing Dibble, and Short & Sutherland the power company.

PALO ALTO, CAL.—City Engineer Byxbee states that the entire capacity of the power plant is now being utilized during the period of the peak load. It would be impossible to get through the winter with the present equipment, but with the increasing demand on the power plant provision must be made for next year. It is necessary either to install new engines or to arrange for the purchase of current.

SAN FRANCISCO, CAL.—Paradise irrigation district 6 per cent bonds to the amount of \$280,000 are being offered subject to prior sale by McDonald & McDonald on a basis to yield 5.60 per cent. The bonds mature serially from 1937 to 1956 and they are part of a total authorized issue of \$350,000. The Paradise irrigation district comprises 11,250 acres and is situated in Butte county about 12 miles northeast of Chico. The assessed value of the district for 1917 is in excess of \$500,000.

SAN FRANCISCO, CAL.—Bonds of the Imperial irrigation district to the value of \$1,500,000 are being offered for sale and bids will be received up to December 18th in the offices of the district in the Masonic Temple Building in El

Centro. They are the balance of an issue of \$2,500,000 and are of the par value of \$1000 each, bearing interest at 5 per cent, payable semi-annually. Bids will be received for the whole issue or any part of it. The bonds are divided into 20 series and fall due from July 1, 1938, to July 1, 1957.

FRESNO, CAL.—The 6100 acres of the Lovelace Reclamation District are now being pumped clear of water by three electrical pumps. A mile and one-half of power line has to be constructed from the Henrietta Station for this project. E. E. Goodwin has signed a contract for the installation of a five-horsepower pumping plant on his eighty acre tract along the Santa Fe just north of Corcoran. Another plant will shortly be installed on the west forty. W. W. Shank has signed up for a five-horsepower plant on his forty acres adjoining the Goodwin place.

FRESNO, CAL.—The San Joaquin Light and Power Corporation, with headquarters at Fresno, has purchased the Merced Stone Company's plant and power lines at Kittredge, Mariposa county, and will extend the power lines to several mining claims, as well as Coulterville. The Merced Stone Company has been generating electricity at its plant for energy at mines and has been securing power from the San Joaquin Light and Power Corporation. The plant was purchased for the purpose of development in Mariposa county and especially to be in a position to furnish power for use at the mines.

FRESNO, CAL.—A gigantic plan to harness the waters of the upper Kings river with power plants to generate sufficient electricity for use in the San Joaquin valley and southern California for years to come and an undertaking that will total many millions of dollars is announced by A. G. Wishon, general manager of the San Joaquin Light & Power Corporation. Simultaneous with Mr. Wishon's announcement of the great engineering feat to develop the water power of Kings river comes the report from the State Water Commission that the Fresno Flume & Lumber Company of Clovis has filed application for 200 cubic feet from Dinkey creek and 400 cubic feet from Big creek for power purposes.

THE PACIFIC SOUTHWEST

EL SEGUNDO, CAL.—The Southern California Edison Company has asked for an electric lighting franchise in this place.

WILLIAMS, ARIZ.—A proposition to construct an electric light and power plant for Snowflake and Taylor is progressing nicely.

MANHATTAN BEACH, CAL.—The board of trustees has passed a resolution covering the lighting of the Strand, the improvement to be under way about the middle of December, 1917.

SAN DIEGO, CAL.—The San Diego Consolidated Gas & Electric Company has been awarded contracts by the board of supervisors for furnishing electricity for lighting the Imperial Beach, Normal Heights and Fallbrook lighting districts.

PHOENIX, ARIZ.—The Arizona Corporation Commission has authorized the Phoenix Gas and Electric Company to issue \$550,000 bonds, \$185,000 of which are to be debentures. The proceeds are to be used for general improvements and extensions.

LOS ANGELES, CAL.—The report of the County Counsel on the proposed contract for a lighting system in Culver City Lighting District has been ordered to be placed on file by the board of supervisors. The contract has been awarded to the Southern California Edison Company.

BENT, N. M.—The Tularosa Copper Basin Mining Company is planning to enlarge its oil reduction mill and install machinery at its mine in Bent. The company also owns a water power on the Tularosa River, where it proposes to build a hydroelectric plant.

SAN PEDRO, CAL.—Major Newton of the quartermaster's department has received instructions from Washington authorizing the construction of more than fifty buildings at Fort MacArthur, involving a considerable amount of wiring and lighting fixtures.

SAN BERNARDINO, CAL.—The Southern Sierras Power Company has in contemplation the construction of additional hydroelectric plants, which will bring their total installed capacity close to 100,000 h.p. The additional developments are made necessary by constant increase of the connected load.

LOS ANGELES, CAL.—An ordinance has been adopted by the city council granting to the Pacific Electric Railway Company a permit to construct and operate a single railroad spur track upon Wilmington and San Pedro road between San Pedro and Wilmington, and upon certain private property in the city of Los Angeles.

PASADENA, CAL.—The city commission has received bids for the installation of a lighting system on Holly street. The first bids received for the work were considered too high, but the two bids received on the second call are even higher than those offered previously. W. A. McNally & Co. bid \$3702 and D. A. Templin of Los Angeles bid \$3809. The bids were referred to T. D. Allin of the department of public works.

LOS ANGELES, CAL.—Notice is given that an application has been made to the board of supervisors for a franchise, granting the right to construct and for a period of 40 years to maintain and operate a system of pipe lines for transportation of crude oil, gas and water, and to construct and operate a telephone and telegraph system along certain portions of the highways in Los Angeles county. Sealed bids will be received up to December 10th.

SANTA BARBARA, CAL.—The city council is gathering much important information in the move for a municipal lighting system. Reports are being received from Pasadena, Riverside and other cities, where municipal plants or distributing systems are installed, showing big success attained. It is believed that lower rates could be obtained here if the city would install a hydroelectric plant at Mission Tunnel, or even take over the distributing system and buy the power at the city limits.

BEAUMONT, CAL.—Surveyors employed by Los Angeles and Pasadena capitalists are at work between the White-water river and Morongo valley on a project for impounding and using a large amount of water in that section. Plans provide for taking water from Baldwin Lake, Arrastre Creek, Pipes Creek, Snow Creek and other streams. It is proposed to dispose of most of the water in the Coachella valley for irrigation purposes. The remainder will be taken to Imperial Valley for domestic use.

LOS ANGELES, CAL.—A total of \$1,183,340 has been assigned by the Southern California Telephone Company for consolidating the two systems, and for improvements and betterments to the service, according to announcement of Chas. F. Mason, commercial superintendent. This announcement follows the voting by the directors of \$15,680 for small improvements not already covered in the company's budget. These improvements cover the Main, Olive, South, and Wilshire districts, and improvements for private exchange installations.

INTER-MOUNTAIN DISTRICT

MALTA, MONT.—The new power plant is nearing completion.

DEER LODGE, MONT.—The power plant at Bielenberg & Higgins mine in Bear Gulch is nearly completed.

HOT SPRINGS, MONT.—It is reported that Conrad Smith and F. E. Campbell will install a power plant here.

NEZPERCE, IDAHO.—A 40-horsepower boiler and new Cameron pump have been installed at the Samson property on East Eagle creek.

BOISE, IDAHO.—The case of the Oregon Short Line Railroad vs. Wood River Power Company has been dismissed at the request of complainant.

PLEVNA, MONT.—The installation of an electric light and power plant in Plevna is under consideration. Stater Brothers of Baker are interested in the project.

SALT LAKE CITY, UTAH.—The Mountain States Telephone and Telegraph Company are to have larger quarters here, including cafeteria for girls and clubroom for men.

GRANGEVILLE, IDAHO.—Work is progressing rapidly on excavation for a dam being built by the Grangeville Light & Power Company across the South Fork of Clearwater river.

SALT LAKE CITY, UTAH.—The Salt Lake, Garfield & Western has completed plans for the electrification of its line and work on the project has already been started. The approximate cost of the work will be \$250,000.

GREAT FALLS, MONT.—Construction of a new \$150,000 unit of the Montana Power Co. has begun. The structure will be of brick, concrete and steel, two stories, with full basement, 90 x 138 feet. The contract has been awarded to Geo. R. Calvert, local.

RENO, NEV.—The Pacific States Telephone and Telegraph Company is completing its new circuit between Quincy and Reno, consisting of four main lines and two local wires. The new line is much shorter. Clio, Mohawk and Johnsville will be on the local circuits.

GRANGEVILLE, IDAHO.—The Grangeville Light & Power Company is building a dam across the South Fork of the Clearwater River, at a point between the present power house and the present dam. It is expected to have the concrete dam completed within six months.

BONNERS FERRY, IDAHO.—The Bonners Ferry Planing Mill, which was recently destroyed by fire, causing a loss of about \$40,000, it is reported, will be rebuilt at once. The plans provide for the installation of a 600-horsepower turbine engine directly connected to an engine, with individual motors for various machines in the mill.

PAHRUMP, NEV.—The Western Union Telegraph Company has taken over the telegraphic service along the line of the Tonopah and Tidewater railroad. The service now reaches beyond Ludlow to Death Valley Junction, Silver Lake, Tecop and Zazriskie, Cal., and further connections to Ryan, Riggs, Shoshone, Acme, Cal. and Pahrump, Nev.

OGDEN, UTAH.—Brigham City may have another electric lighting system if the state engineer's office grants the application of the Reclamation Power Co., of which Engineer H. S. Kleinschmidt of Salt Lake City is chief engineer. The company has made application for the appropriation of twenty-eight cubic feet of water in Box Elder Creek to generate electric power.

ALBION, IDAHO.—The secretary of the interior has authorized the reclamation service to execute a contract with A. M. Ohl, of Albion, Idaho, for the construction of approximately nine miles of electric transmission line in connection with the Minidoka irrigation project, Idaho. The contract price is \$6,245.20. The line will be used to supply electricity developed at the Minidoka power plant to the Melcher Mining & Milling Company of Albion.

TONOPAH, NEV.—The Nevada California Power Co. has completed its large auxiliary electric power plant and given it a thorough test. The generators are operated by steam and the plant will enable the company to supply local mines with abundant power should storms demolish the transmission lines between here and Bishop, as happened last winter. Completion of the plant also insures steady work at the Great Western and West Tonopah mines.

Ad-itorial Comment

(More useful information is usually to be found in the advertising pages than in the editorial pages of a technical magazine. Ancient history is tabooed, only the latest and best practice is shown, and no time is wasted in getting to the point. The length of an ad is a measure of the distance in thought between the writer and the reader. Consequently ads are really tabloid articles. This page contains rapid-fire remarks about those advertisers who have something new to say in this issue.—The Aditor.)

Some one has called machinery the subconscious mind of the world. The greatness of a civilization depends upon its getting machines to do its work automatically. This is the function of the **Electric Controller & Mfg. Co.**'s automatic compensator as a starter of motors. It gives skilled labor an opportunity to do other things. It not only saves labor but actually does the work better.

Universal home needs stand for true thrift in gifts. **Landers, Frary & Clark** have utilized this appeal in some effective selling ideas for the electrical merchant. Their window and counter displays feature the serviceability of electrical gifts in general and Universal devices in particular. The merchant who stocks this line can count on the fullest selling co-operation.

An ingenious adaptation of the Westinghouse air-brake patents has given a wonderfully efficient and satisfactory method of automatic oil stoking. So responsive is this system to changes in load that the firing is better done than by the most competent attendance. Furthermore the machine is always awake, nor does it strike for higher wages. **The Associated Engineering & Supply Co.** have a wealth of interesting facts about the satisfaction given by this system.

For the man who uses tape—and what electrical man does not—some valuable suggestions have been made by the **N. Y. Insulated Wire Co.** Their Grimsaw and Competition brands are advertised on the basis of quality rather than quantity for the money.

The Pacific States Electric Co. attract favorable attention by a reproduction of an effective illustration of the electrical Santa Claus. The original is in four colors and is available in several sizes for window and store display, being one of many means whereby the Pacific States Electric Co. helps to move the goods off the counter. The list of what to give electrically is an excellent suggestion as to what to stock so as to meet this year's tremendous demand for practical gifts.

To tell "the reason why" always strengthens conviction. To say that G. E. air circuit breakers are efficient is a fact supported by the **General Electric Company's** reputation. But to prove the fact by explaining the positive locking mechanism substantiates both the fact and the reputation. Facing this advertisement the **General Electric Company** also shows a beautiful picture of a modern city by night. But without the Type H power and distribution transformers this beauty would cease to exist in most American cities. The picture tells the story better than any amount of text.

Motors make this old world go faster. But in these strenuous days the question is to find a suitable motor in local stock, ready for delivery. **The Garland & Affolter Engineering Co.** have a ready answer to the question with the **Howell** polyphase motor and the **Peerless** single-phase motor.

Electrical dealers might well sell goods by the same arguments which induced them to buy. **The Hurley Machine Co.** have embodied some strong selling talk in their advertisement of the Thor "no trouble" electric cleaner. This striking expression "no trouble" should turn the customer the Thor way every time.

The man who wants to know the last word in distribution line construction should refer to **Hubbard & Company's** advertisement of new Peirce specialties. Here are seven ideas that save labor and material, eliminate trouble and promote safety. This concern has been especially progressive in adopting Pacific Coast suggestions.

The piping installation of a modern power plant is essentially the work of specialists. **The Pittsburgh Piping & Equipment Co.** qualify for the first place in this respect. Their advertisement emphasizes the value of their personal supervision of the work.

The R. Thomas & Sons Co. show a 25,000 volt insulator to typify the strength and ruggedness of their product. They have an insulator for every service and are anxious to aid in the selection of one best suited to your needs.

Sprague BX cable is especially adapted to the wiring of finished buildings. It appeals alike to the contractor and the owner. The **Sprague Electric Works** give full details in their Conduit Bulletin No. 49600.

The National Lamp Works present an effective illustration of the National Mazda lamp carton together with representation of the twenty labels under which the lamp is sold.

A striking ad and a strong argument is that of Westinghouse jet and surface condensers as published by the **Westinghouse Electric & Mfg. Co.** When a condenser gives such reliable service in remote localities the same dependability will be found wherever installed. As many readers of the Journal are off in the wilds they will find a special interest in studying this proposition.

For the past two months the **Westinghouse Lamp Co.** has been featuring the extensiveness and the intensiveness of its distributing organization. In this issue a two-page spread gives the names of 124 California agents as a concrete example. Each of the other western states is proportionally as well served.

Only a few years ago an induction meter that would not hum was considered a practical impossibility. But now the man who says that a humless meter is impossible is interrupted by the **Sangamo Electric Co.**'s producing it. "Sangamo meters ought to be on your circuit" and they are ready to tell you why.

It is the transformer behind the lamp or motor that counts for continuity and dependability of electric service. The **Wagner Electric Mfg. Co.** tells the reader that they are behind their distributing transformers with that well known apposition, "Wagner, Quality."

The Cutler-Hammer Mfg. Co. make a triple play with their 9116 C-H Starting Switch, and it is safe. One move of the operating handle automatically starts a squirrel cage motor, absolutely protects the workman from injury and also protects the motor from burning out. This mechanism is worth looking into—and even the inspection can be made safely.

We are all so used to thinking of storage batteries as being used only in large aggregations for standby service or electric vehicles that we are apt to forget the many other useful applications. In the November 15th issue the **Edison Storage Battery Co.** called attention to three convenient applications around a power plant:— motor testing, remote switchboard control and emergency switchboard lighting. In this issue details are given of a meter testing set made in the West for the use of Western metermen. Subsequent issues will give detailed information regarding other applications.

A new face is welcomed among the Journal's family of advertisers this issue in the person of the **American Electrical Heating Co.** of Detroit. They show fourteen different kinds of electric heating devices, all backed by a quarter century's manufacturing and sales experience. Emphasis is placed upon the necessity for immediate orders to care for the holiday trade. Several Pacific Coast jobbers have ample stocks.

The unique suggestion of really protecting a motor with a simple fuse is made by the **Century Electric Company** because the Century motor starts on the repulsion principle and "keeps a-running" as an induction motor, thus minimizing the maximum current demand. This feature also makes this motor especially desirable from a central station standpoint.

"Okonite" has been so widely advertised that it is today synonymous with the standard for rubber insulation. This is the true essence of success—to synomize a name and a product.

More recent improvements have been made in insulator design and manufacture than people realize. They are detailed in a late supplement to the **Locke Insulator Mfg. Co.**'s "Insulator Book," which is in itself the most practical treatise yet written on the use and abuse of insulators. Every electrical man should own his own copy.

The Ward Leonard Electric Co. devote a full page to the good points of their resistance unit. Some one may say that a resistance unit is only a mere detail, but the wise man knows that it takes perfected details to give perfect work. Here is a perfectly insulated unit of specially perfected resistance wire adaptable to any desired resistance or capacity for any purpose. Truly, perfection is the only standard worth striving for.

The Electric Storage Battery Co. suggest many purposes to which storage batteries are applied and show the special adaptability of some one of the many types of Exide cells to each need. The Exide cell excels in insuring the greatest service at the least operating cost.

The oft-repeated statement that the "West is different" is borne out by the **Federal Sign System (Electric)** which announces that Secretary Garfield's order regulating the use of electric signs does not concern Western hydroelectric plants. The real purpose of the order is to help liberate facilities that are tied up in the transportation of coal so that other articles may be moved expeditiously.

To paraphrase,—Weston is to an indicating instrument what sterling is to silver. This name of the **Weston Electric Instrument Co.**, like any other well-advertised name, gives unmistakable evidence of their responsibility for the quality and uniformity of their product.

"Macomb" on electrical porcelain, through the efforts of **Baker-Joslyn Company**, is fast becoming standard on the Pacific Coast. Their advertisement in this issue shows a commendable appreciation of the value of white space in display advertising.

In these days of much idle conversation about conservation actual instances of real saving are most refreshing. The **Westinghouse Electric & Mfg. Co.** cites the increased loads that can be carried on present distribution systems by the mere addition of Westinghouse feeder regulators. They illustrate their argument by a noteworthy installation of thirty large units in Baltimore. A feeder regulator frequently makes additional generating and distributing capacity unnecessary. This is genuine conservation.

CHANGES OF ADVERTISING COPY should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of five days prior to the dates of publication, which are the first and fifteenth of each month. Where proof is to be returned for approval, Eastern advertisers should have copy reach this office at least thirty days in advance of date of issue.

JOURNAL OF ELECTRICITY

VOL. XXXIX NO. 12 SAN FRANCISCO, DECEMBER 15, 1917 PER COPY, 25 CENTS



The Battle Cry of Business



HE PEOPLE OF THE UNITED STATES, IN DEFENSE OF THE REPUBLIC and the principles upon which this Nation was founded, are now taking their part in the world war with no lust for power and no thought of financial or territorial gain.

The issues at stake in this stupendous struggle involve the moral ideals and conception of justice and liberty for which our forefathers fought, the protection of the innocent and helpless, the sanctity of womanhood and home, freedom of opportunity for all men and the assurance of the safety of civilization and progress to all nations great and small.

Speed of production and the mobilization of all national power mean the saving of human life, an earlier ending of the designs of autocracy and militarism and the return to the peoples of the earth of peace and happiness.

Undismayed at the prospect of great taxes, facing the consumption of its accumulated savings, American business without hesitation pledges our Government its full and unqualified support in the prosecution of the war until Prussianism is utterly destroyed.

Assembled on the call of the Chamber of Commerce of the United States and representing more than half a million business men and every industry in every State in the Union, this convention promises to our people that business will do all in its power to prevent waste of men and material and will dedicate to the nation every facility it has developed and every financial resource it commands, on such terms, and under such circumstances, as our Government shall determine to be just.

The best that this country can offer in
men, munitions and material is going
to France.

DURADUCT

is one of them—of course!

Pacific Coast Distributors

BAKER-JOSLYN COMPANY

526 First Ave. So. 71-75 New Montgomery St. 353 East Second St.
Seattle San Francisco Los Angeles

THE BLACK DOTTED LINE
IS THE MARK OF
DURADUCT

JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME XXXIX

SAN FRANCISCO, DECEMBER 15, 1917

NUMBER 12

Contents

FLOOD LIGHTING FOR PROTECTION.....	540
In the protection of the great power plants and industrial enterprises of the West, flood lighting, which started as a decorative feature, has come to represent the strongest defense against bomb plots and foreign spies.	
PRESENT STATUS OF INDUCTIVE INTERFERENCE.....	543
A resume, setting forth the remarkable accomplishments of a joint committee on inductive interference that has devoted five years of research study to this important problem.	
LIGHT DISTRIBUTION FROM PROJECTORS—by <i>Waldo C. Cole</i>	547
The determination of how many projectors to use in covering a given surface is here mathematically figured from the spread of the beam and the areas of greatest light intensity.	
DETERMINATION OF HEATING VALUE OF OILS—by <i>Ribert Sibley and Chas. H. Delany</i>	555
A statement of simple formulas for computing the heating value of fuel oil and a description of a number of calorimeters used for accurately determining this value by experiment.	
TRAPSHOOTING BY ELECTRIC LIGHTS.....	558
A suggestion of a new set of customers for the electrical contractor is made here in the report of several successful shooting meets held by electric light in the West.	
THE JOBBER'S STANDPOINT—by <i>J. I. Colwell</i>	560
The jobber is vitally interested in the welfare of the contractor and dealer and any appearance to the contrary is shown to be a misunderstanding of the jobber's position.	
WESTERN IDEAS.....	562
At the California State Fair—"Electric Heaters Sold Here"—The Trade Mark—The Value of a Conference—Some Recent Novelties—The Delivery Wagon.	
NOTES ON CONTRACT FORMS—by <i>George A. Schneider</i>	566
The use of a standard contract form would not only do away with many of the complications of the contractor's business, but it would prove good advertising for him.	
EDITORIALS.....	537
Merry Christmas—The West Comes into Its Own—A Notable Advance in Merchandising—Inductive Interference Investigation, a Notable Achievement—Flood Light Projectors in Industrial Protection—The Corporation School Idea—The New Journal Service.	
How the West is Helping to Win the War—IV.....	536
Power in the Manufacture of Agricultural Machinery.....	542
War Economy in Australia Affects Public Utilities.....	542
The National Association of Corporation Schools.....	545
Electrical Features of the Campanile Clock.....	546
Bureau of Mines Tells How to Store Coal.....	548
The Electrical Features of a New Ship Industry.....	548
Waterpower in Southwestern United States—by <i>F. C. Murphy</i>	549
Economizing Electricity in Petrograd.....	550
Electrifying Railroads in England.....	550
The Appreciation of Land Values and the Reservoir Site—by <i>C. E. Grunsky</i>	551
Electrical Power Development in Utah.....	554
An Electrical Christmas.....	559
The Modern Electrical Contractor-Dealer—by <i>W. M. Deming</i>	561
Wiring Rules for French Ships.....	564
Standard Code of Practice for Electrical Contractors.....	565
The Wiring of Inflammable Christmas Displays.....	565
Notes on the Law of Patents—by <i>Wm. G. White and H. G. Prost</i>	568
Sparks—Current Facts, Figures and Fancy.....	570
Personals.....	571
Meeting Notices for Electrical Men.....	573
Builders of the West—XIX— <i>W. F. Durand</i>	573
Happenings in the Industry.....	575
Latest in Everything Electrical.....	577
Good Books and Bulletins for Electrical Men.....	579
Latest Electrical Developments.....	580
Ad-itorial Comment.....	583

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THE SEMI-ANNUAL INDEX for Vol. XXXIX, which is completed with this issue, will be sent upon request to any subscriber

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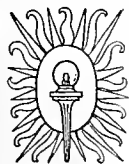
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ASSISTANT BUSINESS MANAGER



HOW THE WEST IS HELPING TO WIN THE WAR—IV

THOUSANDS upon thousands of people viewed with outspoken admiration the beauties of the Panama-Pacific Exposition which competent critics depict as having chronicled the greatest single advance in illuminative effects that the world has ever seen. Little did these visitors dream at that time that these same wonders in scenic effect by night would within two short years be a means for protecting the industrial activities of a hundred million people. Once again has an engineering triumph in the West added its quota toward bringing to a successful conclusion the greatest crisis of all history.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

VOLUME XXXIX

SAN FRANCISCO, DECEMBER 15, 1917

NUMBER 12

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Merry Christmas

That "good will toward men" has now become the slogan of a great nation, from the one who sits in the loftiest chair of authority down to the lowliest one of its hundred million human souls, is indeed the sweetest message which has come to this sorrow torn world since the Shepherds' song of nineteen hundred years ago: "Peace on earth." As men of the electrical industry, we rejoice at this season of the year, for equipped with the subtle force electricity, almost akin to the Divine nature itself, we go forth in the godlike determination to see to it that all men and all nations shall know and honor the voice of the people and the world at last be free. In such a spirit, then, can not we greet each other at this season of the year with a feeling never experienced before, when we say on Dec. 25, 1917: "On earth peace, good will toward men."

The immediate further development of the vast water powers of the West would contribute conspicuously to the three most necessary economic forces for the successful prosecution of the war—by the saving of labor, the stimulation of industry, and the conservation of natural resources.

The West Comes into Its Own

That California is monthly being called upon to supply such enormous quantities of fuel oil—even twenty-five per cent of the world's output—to such an extent that its storage supply is being depleted over the actual production at the rate of twelve million barrels annually is now a matter of public knowledge. This fact was brought out by the California Railroad Commission before a recent gathering of electrical men in this commonwealth.

In the East the enormous demand for coal production is taxing the railroads to the limit. Again, this abnormal demand is diverting labor to assist in the mining of this product and on the other hand the possible depletion of the more easily accessible fields of this great national resource is not to be overlooked.

Naturally, then, the public mind turns with hope of relief to the great West, blessed with millions of possible horsepower in water power development.

In recent years, the hydroelectric utilities of the West have demonstrated, under public regulation, an ability to develop hydroelectric energy and to successfully market this product at such reasonable rates as to satisfy completely the public conscience in the advisability of rational development under private operation.

To develop at once the vast water powers of the West that are necessary for the conservation of fuel, the progress of industry and the stabilizing of labor, will require enormous outlays of money. Already the President of the United States is considering the advisability of the national government's loaning a billion dollars to assist the railroads in the present emergency. Coming now to the water power situation, it is clearly evident that a rational policy of loans from the national government to assist immediate development of the water powers of the West would utilize the powers of our streams and divert them where their energies could stimulate our industries and not, as is now the case allow their waters to flow thriftlessly and aimlessly from the mountains to the sea.

This financing might be accomplished through the ordinary banking channels, if the Federal Reserve Banks were in a position to endorse such loans as war time measures after due investigation and approval by the utilities commissions of the respective states.

The immediate need of governmental loans of this nature is keenly felt in the West. Take the case of but one instance as an example. In the watersheds of the San Joaquin and Kern rivers alone are located sufficient power, so competent engineers report, to develop energy to conserve the twelve million barrels of oil that are now being depleted annually from storage supply in California. Granted that it would take a hundred and twenty-five millions of dollars to properly develop this power, it takes no imagination

of extraordinary power to see that a brief ten years' saving in oil by means of such a development as this would conserve forever a lasting and necessary industrial activity that neither time nor the ravages of war could take from posterity.

It is to be hoped that the authorities having the matter in charge will take early favorable action for legislation looking toward governmental financial assistance in such developments.

A Notable Advance in Merchandising

From time to time, those who are engaged in the electrical business have given more or less expression to the necessity of closer co-operation between the various branches of the electrical industry. Due credit should be given to the central stations of the West, and particularly to their strong organization, the Pacific Coast Section of the National Electric Light Association, who have since their meeting held at Riverside, in April of this year, succeeded in bringing the lighting and power industries, electrical manufacturers, jobbers, contractors and dealers closer together.

It was through the broad view taken by the officials of the central stations of the Pacific Coast Section of the National Electric Light Association that made it possible for members of the various branches of the industry to sit together on the various committees, in order that they might exchange ideas—discuss the different problems that would lead to closer co-operation and a better understanding of the responsibilities each branch of the industry owed to the other. As an outgrowth of this general co-operative movement, the Commercial Committee of this organization has submitted a plan to the Executive Committee which has been approved, as set forth on page 574 of this issue.

It is the intent that the work outlined should cover a period of one year, starting January 1, 1918, ending December 31, 1918.

A great deal of responsibility in the success of the campaign will fall upon the committee appointed, which represents the various branches of the industry, and without the support of all of the various branches, it will be impossible for this committee to carry on this work successfully.

With the assurance of the undivided support of the central stations, it is sincerely hoped that all those engaged in the other branches of the electrical industry will seriously get behind the movement and do their part to successfully carry out the contemplated plan.

Each branch of the industry is affected just as much as that of the other, and the proportion of benefit each receives will be dependent upon the amount of effort put forth individually in supporting and carrying out the suggestions offered by the committee—whether they be right or wrong—that in the end after a fair trial all may be convinced of the sincerity of purpose and desire of all interests to do their bit and that unselfishly.

If there have been any misunderstandings between the various branches of the industry in the past, it is hoped such will not stand in the way of progress,

and that all may start anew, and thereby convince those similarly interested in other parts of the country, of the aggressiveness of the electrical interests in California and the continuous advancement of the co-operative idea in the West.

A beautiful piece of scientific work has recently been completed in the West that will at once attract nation-wide attention. The advent of the harnessing of water powers in mountainous districts of this section and the transmission of these energies to industrial centers often hundreds of miles distant early developed inductive interference with telephone circuits to such an extent that the solution of this problem became one of the first magnitude.

In 1912, under the auspices of the California Railroad Commission a joint committee on inductive interference was appointed, composed of engineers from all parties to the issue. Perhaps no other problem involving such severe mathematical analysis as this has ever arisen for solution and been so successfully handled.

For five years the investigation has been under way and is now brought to a successful conclusion.

Some idea of the magnitude of this work may be gathered from the fact that the technical report of the committee comprises among other matter over two hundred curve sheets, setting forth some three thousand curves.

The publication of all of these data is contingent upon the receipt of a sufficient number of orders substantially to defray the cost of printing and binding. All persons who are interested in procuring a copy of this publication should communicate at once with the Chief Engineer of California Railroad Commission to this effect. This work is a monument that should be preserved for all posterity and its contents should be widely disseminated.

On another page of this issue, an extensive resume of the work is set forth. This resume has been drawn for the columns of the Journal of Electricity by the Joint Committee on Inductive Interference.

The entire work constitutes a notable example of the efficiency of co-operative work of engineers, representing conflicting interests, in lieu of methods of litigation based upon meager information concerning the underlying principles and facts of a complex problem.

Aside from the highly practical value of the work contained in this splendid treatise, the silent message it carries of the good to be accomplished under the spirit of co-operative helpfulness is perhaps even the most striking of all.

The rapid rise in the use of the flood light projector in the protection of industrial plants has indeed been marvelous.

Flood Light Projectors in Industrial Protection

Historically speaking the parabolic reflector is interesting. As far back as 1763 the Mersey light-houses of England, under the direction of Dockmaster Hutchinson at Liverpool, used parabolic reflectors consisting of small facets of silvered glass set in plaster of paris. Spherical metallic reflectors were

introduced in France in 1781, followed by parabolic reflectors on silvered copper in 1790 in England and France, and in Scotland in 1803.

It was not, however, until the great Panama-Pacific International Exposition in 1915 that the world as a whole was introduced to the wonderful scenic effects of flood lighting at night by the use of reflectors. While the tantalizing beauty of this great exposition, brought about largely by means of electric flood lighting, will ever remain in the minds of those who beheld it, as a picture of exquisite charm, still it was not until the exigencies of the great world war brought on the necessity of industrial plant protection that the flood light projector has come into its own as a real and necessary adjunct to modern commercial and industrial life.

Throughout the nation much thought and study has in recent months been given to the protection of manufacturing establishments and power generating stations. Especially has this been true in the West in places where a well placed bomb might destroy a dam or an hydroelectric installation that might take years to replace.

It is interesting to note the method employed in flood lighting by night. In the larger industrial centers it is usual to light up not only the premises and its approaches but especially the buildings themselves often are lighted to a high state of illumination. In the protection of hydroelectric plants, however, there has been evolved in the West a different method that it is believed is more efficient for the purposes in view.

Thus at the great Longlake Plant of The Washington Water Power Company twenty-five miles west of Spokane the power house building itself is kept in total darkness while the cliffs and all approaches to the installation are kept well lighted. By means of this procedure the occupants and watchers in the power house are enabled to study all the surroundings without being observed themselves.

The entire problem of protective illumination is one of great importance at the present time and it is believed that the manufacturers of projectors, after careful study of the needs involved, are handling the supply of these articles to the trade in an able and efficient manner.

Electrical men are today facing a new world. Industrial conditions and methods have been revolutionized by the war and the pressing needs of the moment are continuing from day to day to force efficiency and labor saving and invention to meet the situation. It is going to be a more technically specialized world than ever after the war—and it is going to need more technically trained men to run it.

The Corporation School Idea

In the face of this situation, it is obvious to the men of the industry that the body of trained men is decreasing rather than increasing. Europe has suffered terrible losses from her ranks, losses that will to some extent be recruited from our corps. Vast numbers of our own men with years of service before them—men who were just beginning, in fact—have been drawn from among our trained workers to go to the front. Some of these will fail to return, others will drift into new lines of work. The number of college students enrolled in technical courses has been depleted at the same time by the call to the colors, so that the future supply of technical experts will not be adequate even to fill up the gaps in our present ranks, much less to swell the number.

Realizing this situation and foreseeing future need as clearly as we must, we can only set about such remedies as are at hand. In this connection, it is interesting to note the steady progress of the 'corporation school,' that department now so generally recognized in the industries, which offers specialized education for the corporation employees. It is a grammar school, a high school, a university as the needs of the particular group of workers demand. It is helping to educate the trained men to fill the vacancies—it is reaching the man who might otherwise not take the training in an outside school—it is giving him the particular training needed to fill the actual position.

This factor in our industrial development must be one of the important elements in increasing our efficiency, in making the industry of the United States a smoothly run, intelligently directed machine, not only to help win the war, but to meet the demands of competition after the war.

Many of the large electrical manufacturing companies, electric railways and telephone companies already possess such schools—all electrical enterprises which involve any number of employees should realize that the problems of their business can best be met by education.

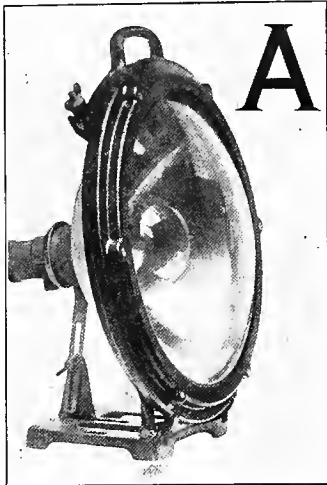
The National Association of Corporation Schools as described on another page of this issue of the Journal of Electricity, is an organization made up by those who have such schools and of those who foresee them as a necessity of the future. Its purpose is the interchange of ideas and experiences, the discussion of such subjects as employment, vocational guidance, insurance plans—what to teach in your school, how to teach it. There is no antagonism between this and other educational agencies. It is working with the public school—in some cases public school teachers have actually come to the plants to conduct classes.

It is a movement in the right direction—too much cannot be said in encouragement of this work. Are you giving it your support by becoming a member, either under the name of your firm or individually?

THE NEW JOURNAL SERVICE: For the convenience of members of the various electrical societies of the West who may wish to refer back to the schedule of their meetings and for the particular use of strangers and travelers who might like to get in touch with the branch of their associations in the town they are visiting, the Journal of Electricity plans to run a directory of the electrical and associated organizations of the West beginning with the issue of Jan. 1, 1918. The officers of the society with their addresses, the time and place for regular meetings and the news of the current meeting are to be included in this directory. If you are the officer of any organization which should be included in this list and have not already been asked concerning your association, write out such information at once, care of The Service Department, Journal of Electricity, in order that it may be included in the first issue of the new year. Notice of change of meetings or election of officers should be promptly forwarded in order that members or visitors be not misdirected. As a Christmas Service in the promise of the new year the Journal of Electricity is particularly glad to be able thus to promote that generous hospitality for which the West is famous.

FLOOD LIGHTING FOR PROTECTION

(The protection of our industrial plants where materials are manufactured and of our great dams where power is stored to run the plants is quite as essential as any plan for the destruction of the submarine. One of the most interesting features of this war has been the adaptation of flood lighting to protective uses. From the Panama-Pacific Exposition where the possibilities of flood lighting were first fully recognized to the present war time situation, the West has taken a leading part.—The Editor.)



A typical long distance flood lighting projector

ANOTHER striking instance of the practical application of a purely æsthetic and scenic effect of illumination is forcing itself upon the industrial activities of the nation in a manner that once again demonstrates the wonders of electricity and its indispensable characteristics as an aid in solving the present national crisis. From the great Inland Empire in and about Spokane, Washington, where electricity drives the mining

output of the Northwest down to the mammoth ship building yards along the waters that flow into the great Pacific, the flood light projector is rendering an invaluable service.



THE COLONNADE OF THE PALACE OF FINE ARTS

Note the detail with which this night scene is shown. Such feats in illumination as this made the Panama-Pacific Exposition world famous. In recent months these same ideas have developed a new nation-wide activity in the protection of industrial plants from prowlers by means of flood light projectors.

In war time it is vital that our industrial plants, railways, yards, bridges, power stations, and all means of supply and distribution be safeguarded. Adequate protection in the daytime is a comparatively easy prob-



THE HALSEY POWER HOUSE

Night view of an out-of-town hydraulic power station lighted with ten flood lighting projectors with 400-watt Mazda C lamps, located in two banks of five units each. Each bank is hidden in shrubbery 200 feet distant from the building and arranged so as to light a side and one end of the building. This particular plant can be seen for miles at night as well as by day from the Lincoln Highway and one of the transcontinental railroads.

lem but at night, when the dark hours afford cover for the prowler with intent to destroy, effective artificial lighting, to enable the guards to cover their territory efficiently is imperative.

In designing protection lighting, a few of the fundamental principles of illumination should be followed. Objects are seen by the light reflected from them to the eye and not by the light that comes from the light source directly to the eye. In designing protection lighting, therefore, two things should be kept in mind. As far as possible the light sources should be so placed as to throw the light upon the object to be seen and to enable the guards to stand in the unlighted area so that they are unseen by the approaching prowler. The guards should be protected as far as possible against glare from bright light sources. At the same time, the brighter the source in the field of vision of the approaching prowler, the more difficult it will be for him to carry out his plan.

Flood lighting projectors which consist of parabolic reflectors or a modification of parabolic reflectors properly mounted with concentrated filament Mazda C lamps will probably enable the best solution of the majority of protection lighting problems. Fig. 1 is typical of the flood lighting projectors now available. These can be obtained in a number of different types, some giving a high powered beam for long distance work while others spread the light out over a large



THE MARIN COUNTY SUBSTATION

Night view of the Pacific Gas & Electric Company's Marin County Substation, lighted by nine flood lighting projectors with 400-watt Mazda C lamps. They are placed in two banks, one of four units and the other of five units. Each bank lights up an end and one

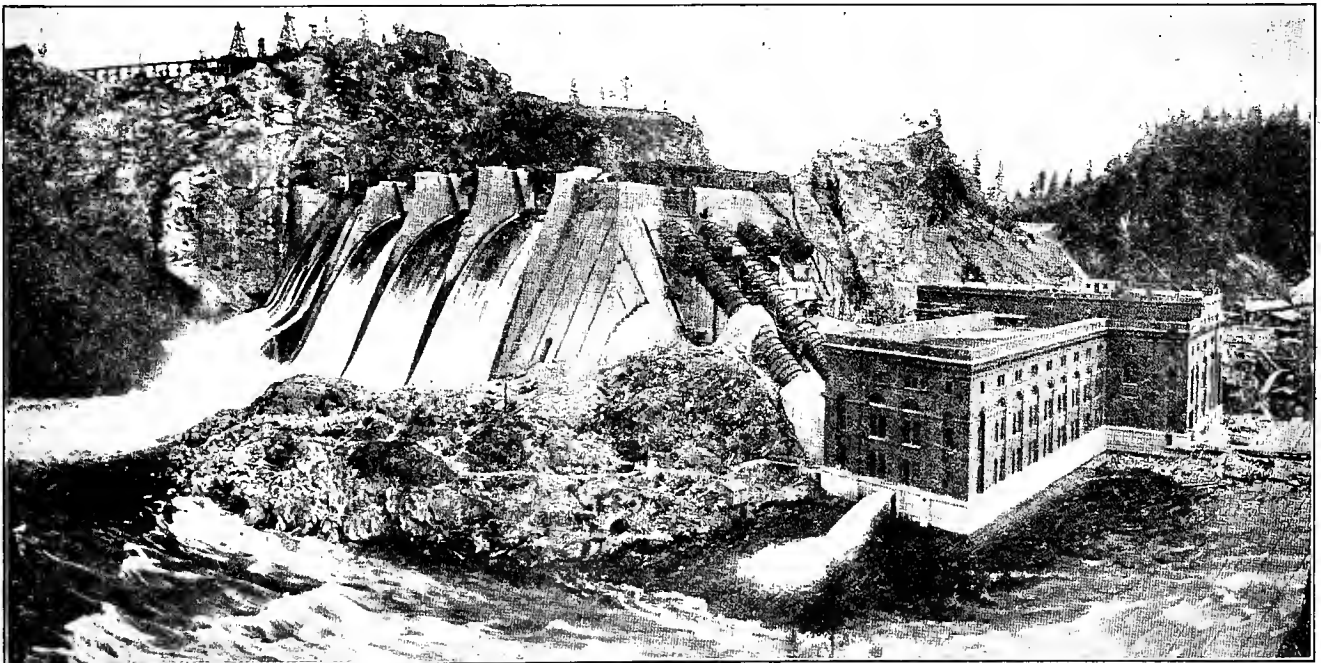
side. The one of four units is placed in the switching tower, 100 feet from the station and the one of five units is hidden in the bushes, 200 feet from the building. The effect of flood lighting a hillside is shown in these illustrations.

area. These units have the added advantage that they throw a cone of light comparatively high in power in one direction so that a guard standing back of them will be in shadow, unseen by any one approaching who will be blinded by the light.

A satisfactory method of lighting for large industrial plant which has a high fence around the building and grounds is to place high powered lighting projectors, equipped with 400-watt flood lighting Mazda C lamps, stationed about 300 feet apart and ten feet high along the top of the fence. This makes a ring of light around the plant. No one can pass through it without being seen. By placing these projectors so that all of the beams of light are pointed in one direction, there

will be no annoying glare in the eyes of the patrols when they walk in the same direction the beams are pointed. Where the buildings are on the street line and no protecting fence is provided, the projectors may be placed on arms built out from the roof of the building, with the beams of light directed so as to strike the ground about 200 feet away.

Another effective way of applying these projectors is to mount the wide angle type on top of the buildings so that they throw their cone of light away from the buildings, thus illuminating a large area about the plant. By mounting the projectors in banks and fanning out the beams, an extremely effective and very economical installation can be made.



THE LONGLAKE PLANT OF THE WASHINGTON WATER POWER COMPANY

Here is a power plant that in its flood lighting protection features is establishing a unique and efficient record. This plant, which will ultimately have a capacity of 56,000 kw., is an important link in a chain of hydroelectric activity in the great Inland Empire in and around Spokane, Washington. Power from this system is used to supply the industrial activity of a district which produces over

one-third of the entire lead output of the United States and a very large proportion of the zinc, two metals widely used in munitions manufacture. At night the power plant, efficiently mounted with guards, stands in total darkness, while the cliff and all avenues of approach are so lighted as to make the unnoticed advent of a nocturnal visitor an impossibility.



A CITY SUBSTATION

A city substation in San Francisco permanently lighted by means of specially designed units, located at the curb line and equipped with 500-watt Mazda C lamps, backed by shell shaped reflectors and protected by hemispherical glass globe.

A modification of this system is one in which a number of flood lighting projectors are mounted on a watch tower overlooking the ground. By means of these, the guard located in the tower commands a view of the lighted zone entirely surrounding the plant. Augmenting this with a high tower searchlight for long distance work, an extremely large area can be covered very economically and with few guards.

Another method employed by one of the large Pacific Coast power companies is to mount projectors at some distance from their stations and power plants



A FACTORY AT STOCKTON, CALIFORNIA

Here is an instance of how factories are flood lighted by night in order to safeguard the industry for national service.

for the purpose of lighting up the buildings, as well as the surrounding area. A number of good illustrations of this method are given. The power house or substation is the heart of the city's lighting and power system and anything happening to them would seriously cripple not only the lighting of the city but also the power for the industrial plants. On the Pacific Coast this is particularly important since a large number of the industrial plants are directly dependent upon the central station for their power. Flood lighting the power house is protection at the source of power.

POWER IN THE MANUFACTURE OF AGRICULTURAL MACHINERY

The United States Census Reports for 1914 just recently issued contain information as to the use of electric power in the manufacture of agricultural machinery. As compared with 1904, there has been a great increase.

The total primary power increased 35.3 per cent during the decade. Power generated by steam is the principal kind used, representing 65.6 per cent of the total in 1914, 71.5 per cent in 1909, 86 per cent in 1904. Water wheels, turbines, and motors have decreased in number from census to census since 1904, but show an increase of 32.2 per cent in horsepower for the period 1904-1909, and a loss of 2,699 horsepower, or 32.2 per cent, in 1914 as compared with 1909. The most important gain is shown for rented electric power, which increased from 3,828 horsepower in 1904 to 30,764 horsepower in 1914. In 1904 only 4.3 per cent of the total primary horsepower was rented electric power, but the proportion increased to 25.3 per cent in 1914. The electric motors run by power generated in the establishments reporting increased 360.1 per cent in number and 210.1 per cent in horsepower during the decade.

The number of steam engines and turbines decreased 32.7 per cent between 1904 and 1914, and electric motors increased more than sixfold in the same period. Of the total number of electric motors in 1914, 45.2 per cent were operated by rented power and 54.8 per cent by power generated in the establishments reporting.

DEPTH OF WATER FOR IRRIGATION

In Bulletin 115 of the Utah Station the moisture present just before and 24 hours after irrigation was determined on a large number of plants of loam soil on which different depths of irrigation were applied. The results are summarized in Table 1.

Table 1. Depth of Water Retained by Loam Soil From Different Irrigations.

Depth of irrigation. inches.	Number of trials.	Inches depth of water in upper 8 feet of soil.			Percent- age unac- counted for.
		Before irrigation.	24 hours after irrigation.	Amt. unac- counted for.	
2.5	36	13.42	15.90	0.02	1
5.0	236	17.31	21.07	1.24	25
7.5	77	15.58	20.85	2.23	30

These results show a considerable proportion of the water applied passed below 8 feet in depth when a depth of irrigation as small as 5 inches was used.

PRESENT STATUS OF INDUCTIVE INTERFERENCE

(Inductive Interference between power lines and telephone circuits has long been a problem that has perplexed engineers the country over. Especially has this problem proven difficult of solution in the West where hydroelectric powers in the mountain fastnesses must parallel for long distances the commercial lines of telephone companies. Here is an excellent resume of the final work on inductive interference which will prove of nation-wide interest. This article has been prepared for the Journal of Electricity by the California Joint Committee on Inductive Interference.—The Editor.)

With the presentation of its final report, dated September 28, 1917, the Joint Committee on Inductive Interference, which has been investigating for the past five years, under the auspices of the California Railroad Commission, the disturbances in communication circuits caused by induction from neighboring power circuits, announces the conclusion of its work.

A preliminary report was rendered by the Committee in 1914*. Besides a discussion of technical features of the problem, rules were recommended to the California Commission, to regulate the practices of companies operating power and communication lines in proximity to each other. These recommendations were embodied in General Order No. 39 of the Commission, which has been in force since August, 1914.

The final report just issued and based on more extensive investigations conducted since 1914, includes:

1. An historical sketch, regarding the formation, personnel, organization, investigations and finances of the Committee.

2. A review of the basic principles, comprising a simple statement of the nature of the subject, a summary of the facts established or agreed upon, and a concise statement of the guiding principles for the prevention of interference.

3. Recommendations for revised rules to govern the design, construction and operation of power and communication lines and associated apparatus, to prevent or mitigate inductive interference, followed by explanatory comments.

The new rules mark a considerable advance both in substance and form as compared with the 1914 rules. The principle of co-operation in determining means for avoidance or mitigation of interference is emphasized, in conjunction with definite guiding rules, where such are practicable. Certain precautionary measures are made applicable to all new construction. The principle of employing the remedial measure involving least total cost for a given benefit, irrespective of whose plant is changed, is declared. The arrangement of the rules has been entirely changed. A detailed summary of the recommended rules is given below.

An exhibit accompanying the rules, discusses the arrangement and spacing of power conductors.

4. Five appendices complete the report, dealing with:

- (1) Interference not covered by the recommended rules, which apply to constant-potential alternating current power circuits of over 5,000 volts between wires, or 2,900 volts to ground, and exclude telephone subscribers' loops.
- (2) List of technical reports prepared by the Committee as a record of its investigations.
- (3) Comments on the 1914 report.
- (4) A bibliography.
- (5) A chart showing the organization of the Committee.

*See Trans. A. I. E. E., Vol. 33, 1914, p. 1441 to p. 1508.

The development of the power and communication services in California brought to a climax in 1912 the problem of interference by induction. The California Railroad Commission was called upon to adjudicate several cases of proposed power line construction paralleling long distance telephone, telegraph and railway signalling lines, which had been protested by the telephone interests. Before these cases came to a formal hearing, however, the companies principally concerned reached an agreement, which was approved by the Commission, to make a field investigation of the physical conditions involved in such interference. About two months later the Commission called a conference of representatives of the various interests in California, which was held on December 16, 1912, resulting in the formation of the Joint Committee on Inductive Interference, composed of engineers representing the Railroad Commission, railroads, power, telephone and telegraph interests of the State. This Committee, which was authorized to investigate and report to the Commission, took over the field work which had already been started by the companies as referred to above.

Under a Sub-committee on Tests, experimental investigations were conducted upon several long parallels involving a 22 k.v., three phase, 60 cycle system isolated from ground, and a three phase, 60 cycle system with lines of 22, 33 and 55 k.v., having grounded neutrals at one or more points, with long distance telephone, telegraph and railway signal lines. Most of these tests were made at Morgan Hill, Salinas and Santa Cruz, with the aid of a rather elaborate field laboratory, many of the tests being conducted with the power lines in normal operation.

A great amount of computation was required to analyze the experimental results, and besides this, theoretical studies were carried out. Much effort was required to develop suitable methods of measurement and to calibrate the instruments employed.

In the interest of a general survey of interference conditions in the State, information was collected from the several companies, concerning the parallels in which they were involved. Observations of the residuals of two grounded-neutral systems were carried out with a small portable outfit for measuring the magnitudes and frequencies of the harmonic residuals, at five different points besides those where the field laboratory was set up.

In giving its approval to the first report of the Committee, the Railroad Commission authorized the continuance of the investigation to secure more definite information concerning the effect of transpositions and the causes and effects of residuals. In carrying out this program, the field laboratory was moved to San Fernando where a 15 k.v. circuit, 37 miles in length, paralleled by a telephone circuit on the same poles, was entirely at the Committee's dis-

posal for several months. During this time, the factors affecting the residual voltages and currents of power circuits whether isolated or with grounded neutrals; the effectiveness of transpositions in neutralizing inductive effects; and the magnitude of inductive effects in short uniform non-transposed sections of parallels, were experimentally investigated.

Investigations of residuals included the effects of transpositions, leakage, accidental grounds and frequency of alternations up to 1,000 cycles, for systems isolated from ground; and for grounded-neutral systems, the magnetic density of the transformers and various connections of the transformer banks. In the Transactions of the A. I. E. E., Volume 34, pages 2,113 to 2,125, a more extensive description is given of the San Fernando investigations.

The subjects experimentally investigated at San Fernando were made the subject of intensive theoretical studies. In conjunction with the work on induction in short uniform untransposed parallels, calculations were made to determine the accuracy with which the interference could be predicted by computation. Since June, 1915, the headquarters of the Field Engineering staff have been at San Francisco where these studies and the later work of the Committee have been carried out.

The results obtained at San Fernando showed that it was feasible to study by means of computations the effect of variation of spacing of conductors, separation of power and communication lines, size of conductors, heights above ground and configuration, on the intensity of induction. A study has been made covering the configurations, relative positions, etc., most commonly occurring for three-phase lines, the results of which are embodied in Technical Report No. 65 of the Committee, comprising 214 curve sheets and over 3,000 curves.

Coincident with its investigations, the Committee arranged for tests by the American Telephone and Telegraph Company, Western Union Telegraph Company and the Postal Telegraph Cable Company to determine the detrimental effects of extraneously induced currents on the operation of telephone and telegraph receiving apparatus, that is, the interference due to specified amounts of current of a given frequency in telephone receivers and in telegraph relays.

The detailed record of the investigations of the Committee is contained in a series of 71 technical reports. Thirty of the reports have been selected as being of sufficient general interest to warrant their publication along with the two reports of the Committee to the California Railroad Commission. The reports include not only records of tests and their analyses, but give the methods of working, theoretical discussions, forms for systematizing experimental and theoretical work, and data of general usefulness in predetermining the magnitude of induction to be expected under given conditions and in prescribing remedial measures. All these reports are on file at the offices of the Railroad Commission in California, but unless they are published, the valuable information they contain will not be generally accessible. Their publication, however, is contingent upon the receipt of a sufficient number of orders substantially to defray the cost of printing

and binding. All persons who are interested in procuring a copy of this publication are requested to notify Richard Sachse, Chief Engineer, Railroad Commission of California, 833 Market street, San Francisco, to this effect.

Conditions of proximity of power and communication lines that cause inductive interference are designated by the Joint Committee as "parallels." In preparing the final report, a large amount of study was given to the question of determining the conditions of length, separation, voltage, current, wave shape, balance, conductor arrangement, etc., that would constitute a "parallel." In order to set forth the relations in reasonably simple form, it was necessary to assign definite values to several factors which in practice vary widely in value and which it is usually not feasible to determine in particular cases. It was found that sufficient information was not at hand to satisfy all parties as to the assumptions regarding these factors. The Committee feared that a definition of these relations, based on such assumptions, would be used in cases where the assumptions did not apply. Consequently the report does not include such a definition. The record of work done on this complex problem remains, however, of great value as indicating the general method of attacking the problem, the difficulties to be overcome, and the accomplishment of results up to date.

The report gives the following as the seven "basic physical principles which underlie the rules recommended and which should guide all efforts to prevent inductive interference":

1. Avoidance of close proximity.
2. Elimination or suppression of harmonics.
3. Limitation of residuals.
4. Reduction of intensity of induction by favorable arrangement of conductors.
5. Neutralization of induction by co-ordinated transposition systems.
6. Balancing of metallic communication circuits.
7. High grade construction and care in the operation and maintenance of power circuits.

A brief summary of the recommended rules follows:

The first section entitled: "General Provisions" provides for: (a) Applicability of the rules. Rules on operation and maintenance are to apply throughout; rules for specific parallels, to cases hereafter created; rules not limited to lines involved in a parallel, to new construction, and in the event of reconstruction. (b) Co-operation. (c) Method of remedy involving the least total cost. (d) Existing parallels are to be cared for with due diligence, depending on the seriousness of their effects.

The second section consists wholly of definitions.

The third section entitled: "Location of Lines" requires: (a) Avoidance of parallelism wherever practicable. (b) Advance notice of intention to construct a line which will create a parallel. (c) The distance between parallel lines to be made as great and as uniform as practicable. Where other remedies fail, the separation is to be increased. (d) and (e) Parallels shall be as short, and as free from discontinuities as practicable. Unnecessary crossings of highways are to be avoided.

The fourth section entitled: "Design and Construction of Lines" (a) Requires attention to quality and workmanship to prevent failures causing interference. (b) Consideration of the configuration of power circuits is required, also the avoidance of excessive spacing, long two wire branches from

three phase lines, and single wire grounded circuits. (c) Power circuits are to be transposed throughout their lengths with barrels of 6 to 12 miles, excepting lines under 12.5 k.v. with grounded neutrals and certain lines located on private rights-of-way. Existing power circuits are to be transposed outside parallels hereafter created when necessary for capacitance balance, with regard to discontinuities. (d) Inside parallels an adequate transposition scheme, consisting of coordinated transpositions in the power and communication lines, if the latter are metallic, is to be installed, determined by co-operative study. In general, at least one barrel shall be placed in the power circuit. At highway separations from telephone lines, three mile barrels should ordinarily be employed. For parallels with telegraph lines six mile barrels are ordinarily sufficient. The most economical scheme and utilization of existing transpositions are to be considered.

The fifth section is entitled: "Design, Construction and Arrangement of Apparatus." It provides for: (a) Quality and arrangement of apparatus to minimize interference. (b) Rotating machinery should have good wave form. Grounds on generators are to be avoided, unless the arrangements are such as to avoid unbalancing the circuit and introducing residuals. (c) Transformer exciting currents should be as low as is consistent with good practice (for most cases less than 10 per cent at normal voltage). Grounded single-phase, grounded three-wire two-phase, and grounded open-star three-phase connections are prohibited. Star connected auto transformers with grounded neutrals on three-phase lines in parallels must also have low-impedance, delta-connected windings, or other equivalent means of suppressing triple harmonic residuals. (d) Auxiliary devices to prevent distortion of the waves by rectifiers, etc. are to be installed where necessary. (e) One oil switch with poles mechanically interconnected for simultaneous operation is required between a parallel and the source of supply of the power line to operate automatically in case of abnormal conditions, except where an operator is on duty. Consideration is to be given to switching arrangements to minimize transients. Where air-break or single-pole oil switches cause trouble, oil-switches with poles interconnected are to be used. (f) Fuses are to be avoided for main lines in parallels. (g) Electrolytic lightning arresters are to be equipped to minimize their disturbing effects. (h) Indicating devices are to be provided at supply stations to give warning of abnormal conditions, and ammeters are to be installed in important neutral-ground connections. (i) Apparatus for metallic communication circuits is to be well balanced.

The sixth, and last, section is entitled: "Operation and Maintenance" and requires: (a) All reasonable care by power and communication interests to minimize interference and, in particular: (b) prevention of mechanical and electrical failures which would cause or promote transient disturbances and unbalanced loads. (c) Daily record of current in grounded neutrals of important stations. (d) Transformers are not to be operated at more than specified percentages above normal voltage. (e) Care shall be exercised to avoid switching disturbances. (f) Where lightning arrester charging disturbs, it should be done in the early morning. (g) A definite procedure shall be provided for station operators during times of abnormal unbalance on power lines involved in parallels. In general, the section of a faulty line passing a parallel should be disconnected until cleared, and not energized more than once in locating the fault. To facilitate the study of such cases, accurate records are to be kept of occurrences under abnormal conditions.

The entire work of the Joint Committee on Inductive Interference constitutes a notable example of the efficiency of co-operative work of engineers representing conflicting interests in lieu of methods of litigation based upon meager information concerning the underlying principles and facts of a complex problem. As

perhaps the chief result of this effort on the part of the Joint Committee, there has been created in the State of California a realization of the seriousness of inductive interference, an understanding of practical preventive and remedial measures, and most important of all, a disposition on the part of the power and communication companies to co-operate in the solution of the problems which arise from the construction of the two classes of lines in proximity.

That the work of the Joint Committee is fully appreciated by the California Railroad Commission is evident from a letter written by the Commission to the members of the Committee, in which it says:

"In receiving this final report and in accepting the resignations of the members of the Joint Committee, we desire to express to each member of the Committee our very sincere appreciation of the splendid work which the Joint Committee has done during the last five years. The work in its complete form is a monument to this Committee of which each member must be justly proud."

It is a matter of considerable importance to interested utilities, commissions, and scientific men in other states that the results of the Joint Committee's investigations in California will now become available throughout the country.

THE NATIONAL ASSOCIATION OF CORPORATION SCHOOLS

Dr. Chas. P. Steinmetz is quoted as saying:

"Vocational training is the most important industrial problem in this country. . . . The superiority of America in the electrical industry over all other countries is due largely to educational development and co-operation between the manufacturing companies and educational institutions."

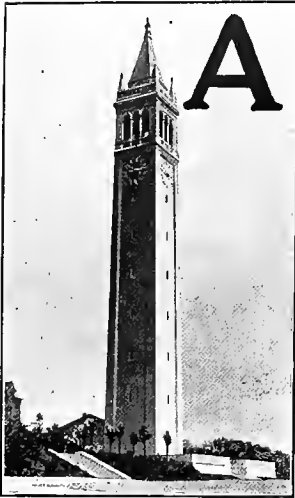
It is just this specialized training—in retail and general selling, in the trades and in office work, that the National Association of Corporation Schools was organized to promote. It is an association of corporations to help them in the specialized education of their employees. It covers other aspects of business efficiency also—the so-called welfare work. Reports have been made on employment plans, safety and health, vocational guidance, public school education, profit sharing, insurance and pension plans. Thus it has become a forum for the interchange of ideas on the principal factors that make for increased efficiency of the working force.

There are three classes of membership in the association: Class A membership is restricted to corporations, firms or individuals employing persons in industrial, commercial, transportation or governmental enterprises. Class B is an individual membership, restricted to employees of Class A members. Class C is open to individuals, not eligible to Class A or Class B membership, who may be interested in the work of the association.

The work of the association is under the direction of an executive committee made up of executives from the various concerns who are members and of prominent educators. The President at the present time is J. W. Dietz of the Western Electric Company and the Executive Secretary F. C. Henderschott of the New York Edison Company.

ELECTRICAL FEATURES OF THE CAMPANILE CLOCK

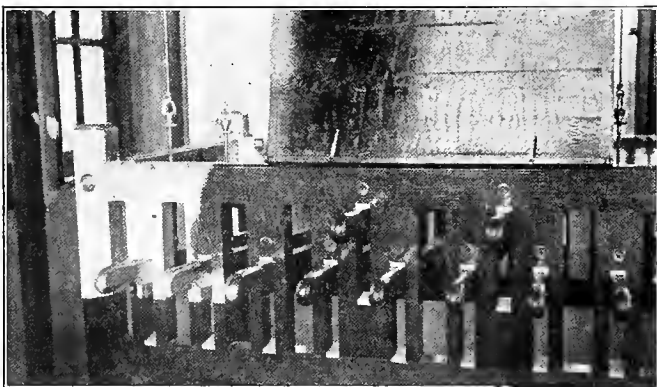
(A telephone to be installed in a tower where there is no one to answer it except the man who runs the elevator and an electric clock which failed to keep time—these were two of the electrical problems connected with the campanile at the University of California. The chimes of the Mills College Campanile have recently been connected up with an electrical keyboard, but as yet the Berkeley chimes are hand operated.—The Editor.)



For some time the four faces of the clock failed to agree

TALL white shaft of granite rising some three hundred feet above the University of California Campus—the campanile is always one of the sights of interest to the visitor to central California. Aside from the sheer beauty of its erectness, however, the building is of interest from the peculiar electrical problems it presents.

In the first place, it was found necessary to provide telephone communication between the caretaker and the University offices. The shaft is provided with elevator service, the elevator making the trip every fifteen minutes, remaining a few minutes at the top, descending, picking up its passengers and rising immediately again. As there are practically always students or visitors waiting to make the trip, the elevator is almost constantly in motion. It proved impractical, therefore, to place the telephone instrument either at the top or bottom of the shaft, there being no one to answer it, and so, with a little ingenuity, it was placed in the elevator itself.



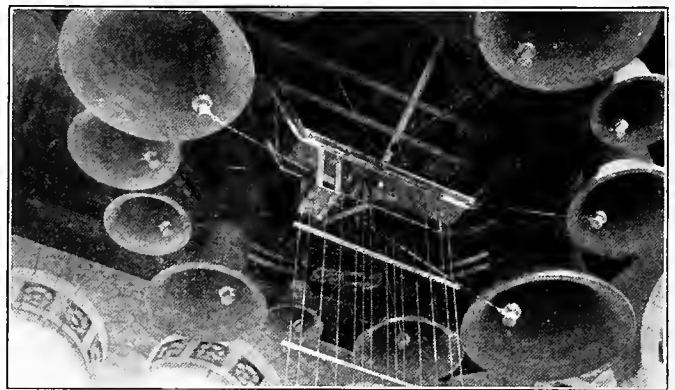
The chimes are hand operated, the entire equipment and keyboard being brought from England

It seems rather startling at first to hear the telephone ring and a conversation carried on while the elevator is in motion, but it is really simple enough, the instrument being connected with a long cord with enough slack to permit the motion of the car.

A second problem was met with in connection with the tower clock. The master clock is located at the base of the campanile, from where it is connected by wires to the University Observatory and from there kept true to standard time. The clock itself is connected electrically with the four mechanisms which

govern the hands on the four faces of the tower. Every half minute a contact is made and an electrical impulse is sent upward that simultaneously winds the mechanisms which thereupon move the giant hands the foot or so which represents a half minute on the dial.

It was soon discovered, however, that the tower clock was keeping poor time—the hand on one face would crawl continually forward, making the circuit of twenty-four hours in an hour or two, on another it would register several minutes late. This was traced



Looking up into the bells—the tenor bell is later to be electrically connected with the master clock and strike the hour

to a difficulty in the winding mechanism. Carbons were used to make the contact and these were subject to varied accidents. Sometimes they fused, making the contact continuous, occasionally they failed to make any contact at all. Finally copper was substituted in their place and up to the present time has proved entirely satisfactory.

Up to a short time ago, the clock was mute. The great bells which were to provide the chimes were made in England and the risk of submarines and war conditions prevented their being shipped. Hours were struck on the old Bacon Hall clock located just behind the campanile so that often enough the apparent striking of the hour and the position of the hands on the great clock failed to agree.

About a month ago the bells arrived from England together with the keyboard and operating device and were set up in the tower. The chimes are not operated electrically but by hand, with the idea that greater variety and feeling can be obtained in this way. The clappers are held by a spring attachment close to the rim of the bell and connected by wires to the handles on the keyboard below. A sharp pressure on the handle sends forth a peal on the bell. One sharp and one flat are provided, so that it is possible to play selections in three keys.

When the copper contact for the tower clock is finally acknowledged as permanently satisfactory and accepted, the tenor bell is to be electrically connected with the master clock below and will ring hours and half-hours,

LIGHT DISTRIBUTION FROM PROJECTORS

BY WALDO C. COLE

(The problem of just what light may be expected from a parabolic reflector under practical conditions is one which it is possible to work out mathematically as is pointed out in the article below. From these calculations it is obviously possible to figure out in advance just how many lights would be needed to illuminate a given area to a given intensity. With the spreading use of flood lighting for protective as well as ornamental purposes, this contribution should prove extremely valuable. The author is in charge of industrial investigations for the San Francisco office of the Westinghouse Electric Company.—The Editor.)

The distribution of light flux or light intensity of an illuminant depends upon the physical shape of the radiant body. By placing selected objects, such as mirrors, etc. around a light source, the distribution of light flux can be changed to meet a predetermined condition.

Distribution curves for three elementary forms of radiant bodies of equal total useful light flux output are shown in Fig. 1. Curve 1 is the distribution from a point source of uniform intensity, an ideal, not a practical condition.

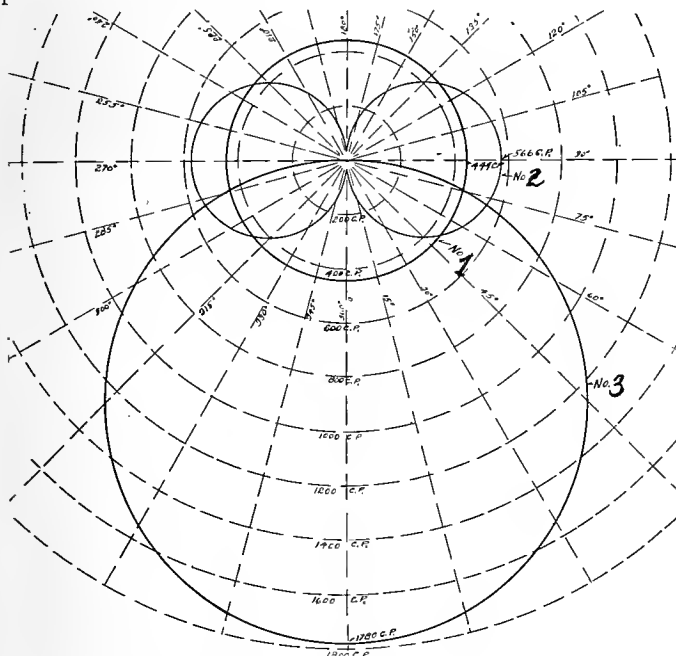


FIGURE 1—DISTRIBUTION CURVES
Light distribution from—
1 A point source or small sphere of uniform brilliancy
2 A straight line or cylinder of uniform brilliancy
3 A circular plane of uniform brilliancy
The total light flux from each equals 5584 lumens.

The distribution of intensity represented by curve 2 is that of cylindrical radiant body such as a straight section of an incandescent lamp occupying a vertical position.

A circular disc of uniform brilliancy in a horizontal position with the luminous side down will give a distribution curve as shown by curve 3 with its maximum intensity vertically downward.

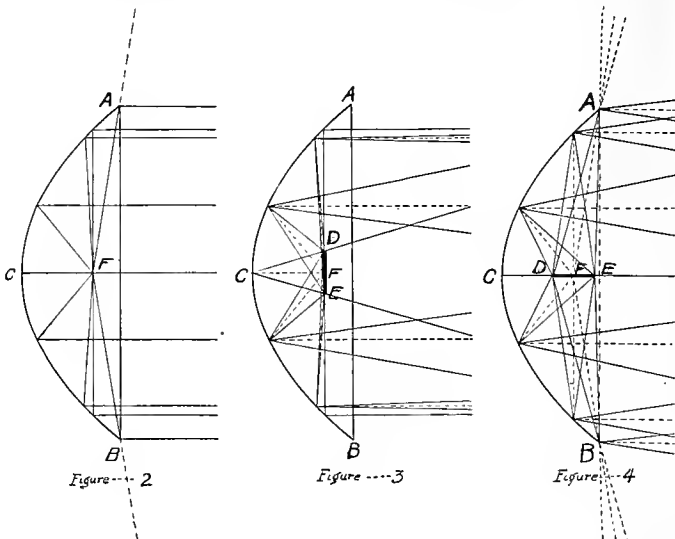
If the three elementary light sources, whose distributing curves have been discussed, were each placed at the focal point of a parabolic reflector, the rays of light falling on the reflector would be reflected as illustrated in Figs. 2, 3, and 4.

In the case of the point source of uniform intensity, as we know, the reflected light rays will be parallel to the axis of parabola as shown in Fig. 2, thus

resulting in a uniform beam of light having the same intensity, neglecting absorption, at all points along the axis of the beams.

The light reflected from the parabolic reflector when the source is a circular disc of diameter DE (Fig. 3), with its center located at the focus F of the parabola and radiating light only from the side next the reflector, results in a beam conical in form and not a true cylinder as in the case of the point source. The light rays originating at the center of the disc and falling on the surface of the parabola alone will be reflected parallel to the axis; those originating from other parts of the light source will be reflected with a certain deviation from parallelism depending upon the position of their origin on the surface of the disc and the point from which the rays are reflected on the surface of the parabola. The greatest divergence of the beam from a path parallel to the axis occurs when the light rays from the circumference of the light source are reflected from the vertex C; this condition is indicated in the illustration by a line from D to C, in return reflected through the point E on the edge of the disc. From this it is seen that to determine the maximum divergence of the reflected beam with a disc source of light such as the incandescent end of an electric arc electrode, all that is necessary is to find the value of the angle DCE when the center of the disc is at the focal point F of the reflector.

With a cylindrical light source placed in the position DE where its middle point is shown at the focal point of the reflector (Fig. 4), the reflected light as indicated will again deviate from the cylindrical form and become conical, whose divergence or spread depends upon the angle subtended by a beam reflected



FIGURES 2 TO 4—EFFECT OF DIFFERENT LIGHT SOURCES
The distribution of rays from a parabolic reflector when the source of light is a point, a circular disc and a cylinder respectively.

from some point on the surface of the parabola between the edge A and the vertex C. The location of this point, of course, depends upon the individual characteristics of the reflector under consideration.

It is easy to see that if the light source in the last two examples were not located with its center at the focal point, the divergence or spread of the beam would be greater than shown in the illustration, providing the radiant bodies were the same size as those used in the preceding discussion.

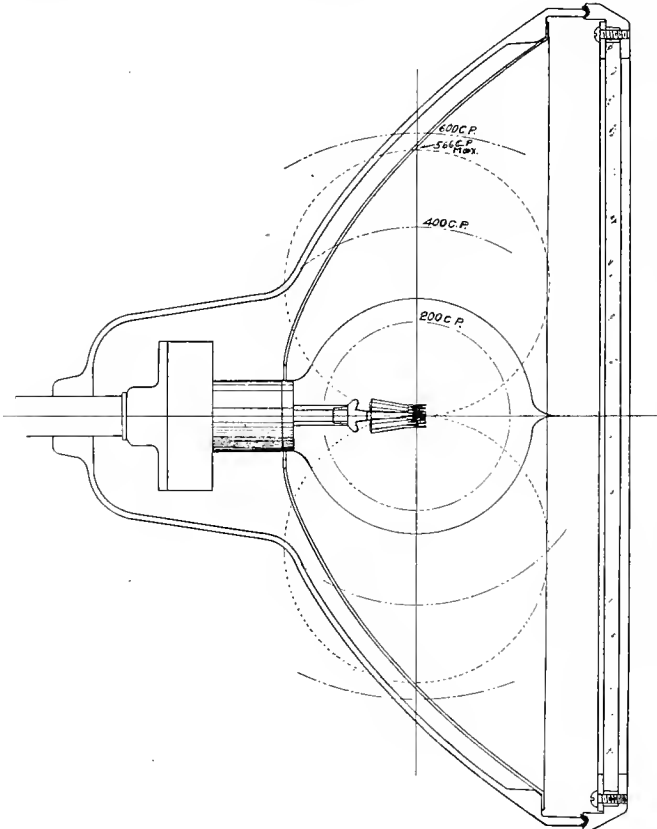


FIGURE 5—THE DISTRIBUTION OF LIGHT ZONES FROM A MAZDA C. LAMP

Note the areas of greatest intensity—this is the effect of light distribution from a source which combines the effect of the vertical and horizontal.

It has been pointed out that the intensity of the cylindrical beam would be the same for any distance along the axis from the reflector. This is not true for the conical beams because as the distance along the axis increases, the area of the beam increases in direct proportion to the square of the distance; but the total light flux remains the same (giving no consideration to absorption losses, etc.), which results in the intensity of illumination decreasing inversely. Thus the intensity of the beam is inversely proportional to the square of distance along the axis from the reflector.

With the points brought out in the preceding discussion, it becomes a comparatively easy matter to predetermine the performance of a flood light projector equipped with a Mazda "C" flood light lamp under operating conditions. Fig. 5 represents the performance of a Universal Flood Light Projector equipped with a 400-watt flood light Mazda C lamp. The lamp filament center is presumed to be at the focal point and an analysis of the reflected beams has been made in the same way as for the elementary light sources to determine the spread.

One point that must be borne in mind in making application of flood light projectors is that the beam is not of uniform intensity but as would be expected from a close study of Figs. 3 and 4, the greatest light flux density is at the center of the beam. This is clearly shown by a number of photometric curves exhibited in the N. E. L. A. Commercial Section Published Papers and Reports of the Fortieth Convention

BUREAU OF MINES TELLS HOW TO STORE COAL

In view of the fact that so many utility and power companies are storing coal, it is thought that the following ten pointers issued by the United States Bureau of Mines will be of interest:

1. Do not pile over 12 feet deep, nor so that any point in the interior of a pile will be over 10 feet from an air-cooled surface.
2. If possible store only screened lump coal.
3. Keep out dust as much as possible. (To this end reduce handling to a minimum.)
4. Pile so that lump and fine are distributed as evenly as possible; not, as is often done, allowing lumps to roll down from the peak and form air passages at the bottom of the pile.
5. Rehandle the screen after two months, if practicable.
6. Do not store near external sources of heat, though the heat transmitted be moderate.
7. Allow six weeks' "seasoning" after mining and before storing.
8. Avoid alternate wetting and drying.
9. Avoid admission of air to the interior of the pile through interstices around foreign objects, such as timbers or irregular brick work, or through porous bottoms, such as coarse cinders.
10. Do not try to ventilate by pipes, as this often does more harm than good.

THE ELECTRICAL FEATURES OF A NEW SHIP INDUSTRY

Many new industries have sprung up in the West, growing out of the wooden ship building business. Not the least interesting is the turning of spars, which is now handled by such concerns as the Western Spar Company of Portland, Oregon. This used to be hand labor—at best handled by steam run machinery—today the entire equipment is electrical.

There are two large wood working lathes, which are equipped so that the timber in the lathe turns at the same time as does the cutting tool which runs on a carriage on a track beside the timber. This plant can turn spars up to 160 feet in length.

The equipment used in this plant consists of 220-volt, 3-phase induction motors as follows: three 15 h.p., three 5 h.p., three 1 h.p. and one 3 h.p. All of this equipment had to be built on the ground as no company was in a position to furnish it.

The 15 h.p. motors are on the carriages to drive the cutting tool and other apparatus and have to be installed with long flexible cable connections so that they may be run back and forth over the 160 foot length of track. This is accomplished by plugging in the center of the run and supporting the cable on strain insulators strung on a steel messenger wire.

WATER POWER IN SOUTHWESTERN UNITED STATES

BY E. C. MURPHY

(Although the rainfall reported for any given year may run into several inches, the question of importance in southwestern power development is the problem of the dry periods. The excessive evaporation and the rapid accumulation of silt make storage difficult. A review of such problems is interestingly presented in the following article. The author is hydraulic engineer with the United States Geological Survey.—The Editor.)

The utilization of water power depends chiefly on the available markets, the cost of fuel power, the magnitude and regularity of the discharge of the streams, and the extent to which the streams are used for other purposes. The Southwest is so largely undeveloped, especially New Mexico and Arizona, that the markets for power at the present time are very small. Coal is abundant in New Mexico and oil in Texas, Oklahoma, and Southern California, so that fuel power there will be comparatively cheap for many years. A person seeing the Southwest during a wet year and having only a short record of the run-off of a stream may form a very erroneous opinion of the possibility of using that stream, on account of the climatic conditions existing there.

Excessive Storage Losses

On account of the long dry periods in the Southwest storage is necessary to utilize any considerable part of the run-off of the streams. The average discharge of Verde River at the mouth during June and July, 1900, was only 7 per cent of the average discharge for the 26 years of record. Two features of the Southwest, namely excessive evaporation from reservoir surfaces and large volume of silt transported by the streams, have important bearing on the value of storage.

The volume of silt carried in suspension by a few streams in the Southwest has been measured for short periods. These measurements show that the streams in this part of the United States carry a much larger proportion of silt than streams in other parts of the country. The most recent estimate for Gila River at the San Carlos reservoir site is that the volume of silt when consolidated in the bottom of that reservoir will be on the average 4,500 acre-feet per year, or 1.3 per cent of the average annual run-off. If the capacity of this reservoir is 54,000 acre-feet it will fill with silt in 12 years, and if its capacity is 18,000 acre-feet it will fill with silt in 4 years of average run-off.

The water of the smaller streams in the timbered parts of the Southwest is generally nearly clear, but during floods many of these streams carry a large volume of sand, gravel and boulders. It is reported that



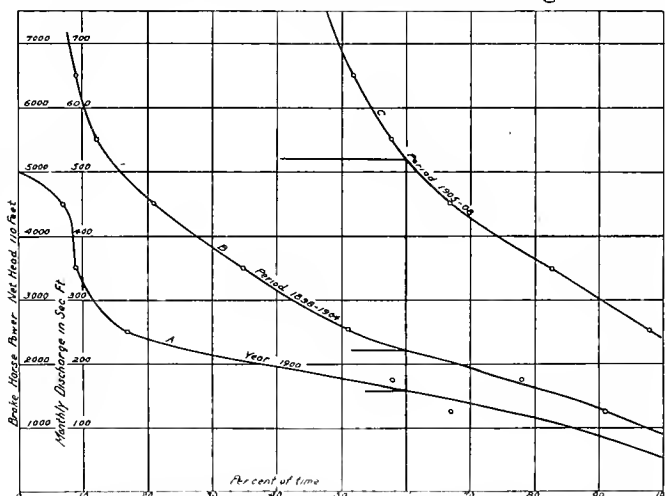
GRANITE REEF DAM

A reservoir of the Southwest which diverts the waters of the Salt and Verde rivers upon 240,000 acres of land.

the capacity of Santa Fe reservoir on Santa Fe Creek, New Mexico, was reduced 40 per cent by debris brought down by one flood. Unless the reservoir on these small streams is built in a depression off the main stream, or provision is made for passing the coarser debris around the reservoir, its life will be comparatively short.

Power Available

The continuous power that can be generated from the streams in the Southwest without storage is small



AVAILABLE POWER ON VERDE RIVER

Power available near mouth of Verde River from a plant with a net head of 110 ft. and turbine efficiency of 80 per cent for varying proportions of the time.

compared with that available during wet periods or during years of average run-off. This fact is well illustrated by the curves in the accompanying figure, which show the power available on Verde River near

creeks in Arizona and Tularosa River in New Mexico that are fed by springs.

ECONOMIZING ELECTRICITY IN PETROGRAD

In view of the serious shortage of hard mineral fuel and wood, municipal works have been forced to curtail their consumption of fuel, with a consequent lowering of production following the ruling of a government committee on fuel saving.

The committee has found it possible to reduce the running schedule of street cars by one hour and will keep in operation the plan of moderate speed that was recently introduced. Among other things, the experiment of decreased speed has given the following results: An economy of fuel amounting to 18 per cent, 30 per cent fewer cars "laid up," and a decrease in daily expenditures amounting to about 3,000 rubles.

The committee recognizes the necessity of continuing the lighting in the central part of the city, but instead of all the lamps being used, only those at prescribed intervals will be lighted. The committee has decided to set a definite hour later than which current will be sent from the station to houses only at an increased rate, which is high enough to prevent most people from using electric light at this time. It was also decided to give special attention to electric signs in moving-picture houses, theaters, and shop windows, in order to put a complete stop to the use of power for such purposes.

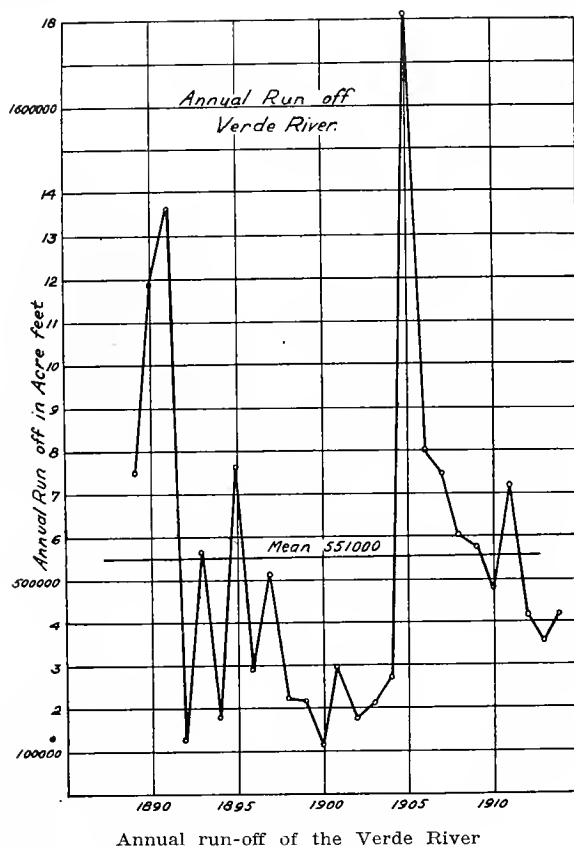
Waterworks—Fuel Regulation in All City Enterprises

The question was also raised of economizing fuel in the municipal waterworks. It was decided that curtailing the activity of the waterworks, with the consequent lessening of the water supply, would not be advisable, but possible economies were seen in connection with the purification of the water. In the past purification of the water has been accomplished by a double process, filtering and chlorinating, of which the former is the more radical and consumes more fuel. It was decided to use in preference the method of chlorinating.

This commission has to work out binding rules for the economic use of fuel in all city enterprises. The necessity of such orders is shown by the careless handling by firemen of coal and petroleum. A technical survey of the department activities gave surprising figures. Thus, in one electric-lighting company, the cost of fuel went 17 per cent above the norm, solely on account of the carelessness of the firemen. Similar results were obtained from a number of other undertakings that were investigated.

ELECTRIFYING RAILROADS IN ENGLAND

Pointing to the successful electrification of American railroads, the Electrical Review of London urges that the policy be further extended in England. English railways have thus far furnished discouraging statistics, but nearly all of these projects originated before the war, when the cost of fuel and labor were relatively much more favorable than they are now, or will be after the war, i. e., the conditions are becoming such that the paying limits of electrification will be greatly extended. Under the probable conditions of the near future British main-line operation by electric traction may become an economic necessity.



its mouth from a plant having a net head of 110 feet and turbine efficiency of 80 per cent for varying proportions of the time of three periods. Curve A is for the year 1900, curve B for the seven years 1898-1904 and curve C is for the four wet years 1905-8. It can be seen that during 60 per cent of the wet period 5,200 horsepower was available, during 60 per cent of the dry period 2,200 horsepower was available and during 60 per cent of the year 1900 only 1,600 horsepower was available. The average discharge during this seven-year period is 300 second-feet and the corresponding power is 3,000 horsepower. The smallest recorded discharge is 32 second-feet and the corresponding power is 320 horsepower. If the installed hydraulic capacity of the plant is 3,000 horsepower, the installed capacity of an auxiliary fuel plant which can keep the output at 3,000 horsepower must be 2,680 horsepower or 89 per cent of the installed hydraulic capacity. During these seven years the auxiliary plant would have been called upon to furnish from 15 to 50 per cent of the total output, the average for the seven years being 26.4 per cent. As the average discharge for these seven dry years is only 40 per cent of the average discharge for the twenty-six years of record, it is evident that only a comparatively small part of the total run-off of this stream can be utilized for power development.

These statements regarding the possibilities of power development do not apply to Colorado River and Rio Grande, which are considered streams of the central West rather than the Southwest, nor to a few of the smaller streams such as Fossil and Cataract

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(The problem of how far the need of the purchaser should enter into the determination of a fair value is one which enters particularly into the problem of reservoir valuation. The market price of the property as it might be used for other purposes in many cases is an even more important consideration. The following compilation of charts and tables covers the situation in the San Francisco Bay region and is characteristic of similar problems elsewhere. The author is a recognized authority on valuation problems.—The Editor.)

THE APPRECIATION OF LAND VALUES AND THE RESERVOIR SITE

The value of reservoir land is not necessarily greater than the value of the same land for other uses. The case may readily be conceived where alternative uses will create values in excess of the amount which could economically be invested in the reservoir property. Under such circumstances either the necessity for the utilization of the site does not exist because alternative sites are available or the water-works system must get along without the storage which the reservoir would have afforded.

The problem of determining the market value of reservoir lands is one of the most difficult that can be presented to the engineer. The question is not what such lands may be worth as a part of a water-works system and how great the sacrifice which an owner of such water-works would make rather than to be deprived of the use of the reservoir, but what is their value in the hands of an owner not in the water supply business as determined by the competition for their acquisition that would exist between various parties who could utilize them sooner or later for reservoir purposes. The problem will involve the weighing, in each case, of all attendant circumstances. This is particularly true when, as in the case of the Spring Valley Water Company's reservoirs on the San Francisco peninsula, the sites occupied are the only ones of their character which are available to adequately fulfill their purpose.

When the reservoir site to be valued is not already in use but the necessity for its use is pressing, it may be proper to determine an upper limit of value by comparison with the next most available source of supply. But any limit thus ascertained is not market value, though it may occasionally be the measure of what the party desiring to use the reservoir property can afford to pay.

Referring now to the increasing value of land in the San Francisco Bay region, the statement may be repeated that land taken in its entirety is increasing in value. Values are increasing not alone at and near population centers but also in broad zones which are more or less directly under the influence of these population centers, and, in fact, wherever population growth and the resulting modification of transportation facilities, by rail, by water or on improved highways have affected or are likely to affect, in not too remote future, the use to which the land can profitably be put.

While this is true and while the possibility is recognized of developing a law approximately true, connecting land value, measured in terms of money, with population or regional density of population,

there will always be local exceptions to any such law. There may be localities too, where the change due to environment will be from a higher to a lower use where value will decrease instead of following the general law of increase. Furthermore, regularity in the rate at which land values advance is not to be expected. A long continued, well defined upward movement in land values has repeatedly, in the history

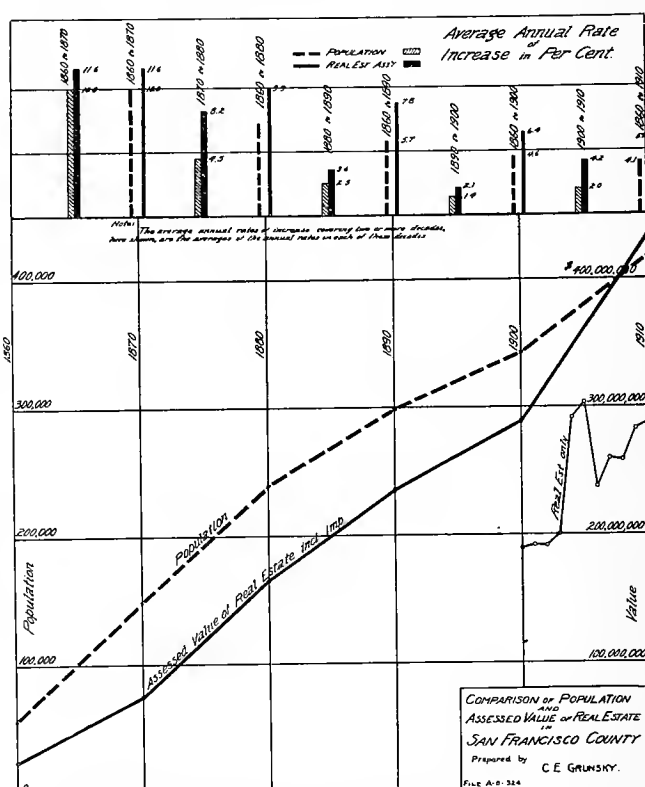


Chart showing comparison of the growth of population with the assessed value of real estate in San Francisco County

of this country, resulted in over-speculation, creating temporary unwarranted or fictitious high values from which there was thereupon a recession or beyond which there would be no further advance until, in the course of time, due to all the factors incident to growth of population and the demand of society for fuller utilization still higher value was created.

To determine population growth and the increasing value of farm lands recourse may be had to the statistics collected by the U. S. census and to the annual county assessments. The facts here presented are the result of recent studies. Due allowance should be made, however, for human frailty and the vagaries of the various assessors and statisticians whose judgment and skill are reflected in the available reports. The figures as presented are but an imperfect guide to what has taken place in the past and should be dis-

counted somewhat when attempting a forecast of what will take place in the future.

Confirmation of the increasing value of land generally and therefore of reservoir sites will be found also in the fact that there has been a constantly increasing density of population in the Bay region, and a corresponding increase in the demand for lands such as those in the various reservoir sites of this region

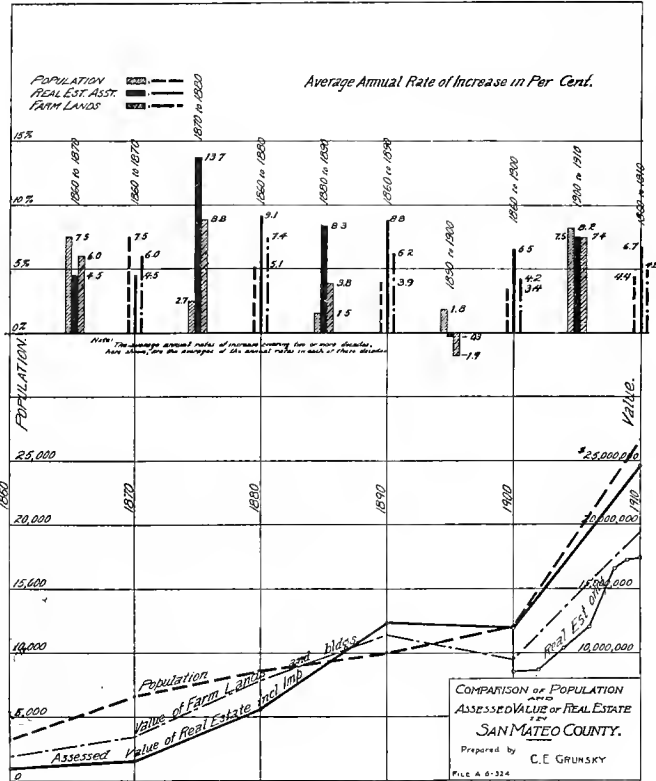


Chart showing comparison of the growth of population with the assessed value of real estate in San Mateo County

which if not held for reservoir use would be available for other purposes.

The assessors' records of valuation for taxation purposes cover the lands in private ownership. Such records as have been published and have been accessible do not give the assessment of improvements separately from the land prior to 1900. For the more recent years, however, the assessed valuation of land, without inclusion of improvements could be noted for some of the counties.

It appears from the tables and diagrams which have been prepared showing this information for California, for the City and County of San Francisco, and for the counties of San Mateo, Santa Clara, Alameda and Contra Costa that: —

During the 40 years following 1870 the population growth of the State of California when considered by ten year periods has been at an average rate per decade of 44% or about 3.7% per year.

The population growth of San Francisco has been about 30% per decade on an average for the same 4 decades or about 2.7% per year.

The population growth of Alameda county in the same period has been about 59% per decade or about 4.8% per year.

The population growth of Santa Clara county in the same 40 years has been about 34% per decade or about 3.0% per year.

The population growth of Contra Costa county in this period has been about 39% per decade or about 3.2% per year.

The population of San Mateo county has increased during the 40 years under consideration between 3% and 4% per year. During the 20 years 1880 to 1900 the population growth in this county was only between 1.5% to 2% per year.

The population of California and of each of the five counties, San Francisco, San Mateo, Santa Clara, Alameda and Contra Costa, as determined by the U. S. census at ten year intervals since 1860 is noted in Table 1.

TABLE 1.
Population of California
and of Counties in the South San Francisco Bay Region

Year	California	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa
1850	92,597					
1860	379,994	56,802	3,214	11,912	8,927	5,328
1870	560,247	149,473	6,635	26,246	24,237	8,461
1880	864,694	233,959	8,669	35,039	62,976	12,525
1890	1,213,398	298,997	10,087	48,005	93,864	13,515
1900	1,485,053	342,782	12,094	60,216	130,197	18,046
1910	2,377,549	416,912	26,585	83,539	246,131	31,674

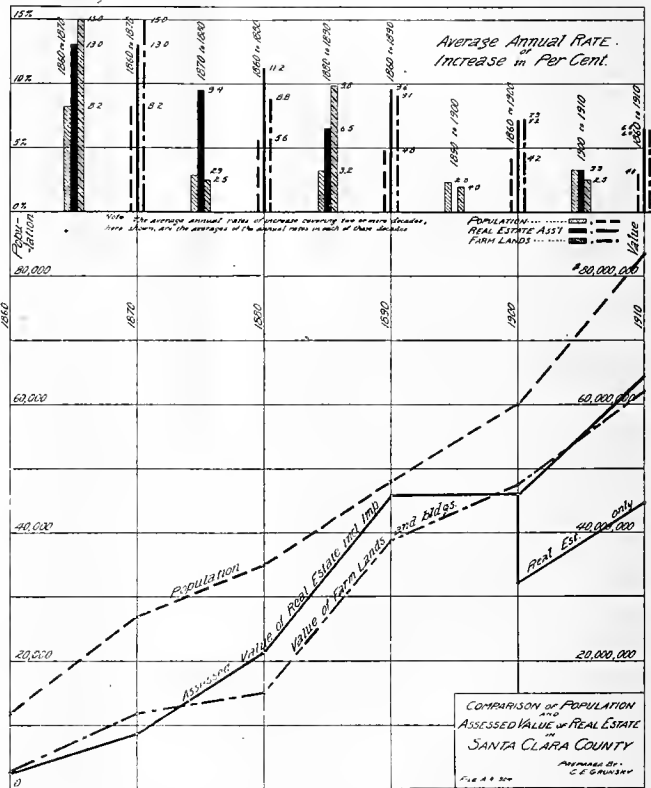


Chart showing comparison of the growth of population with the assessed value of real estate in Santa Clara County

TABLE 2
Population Growth
California and South Bay Counties
Increase since last Census

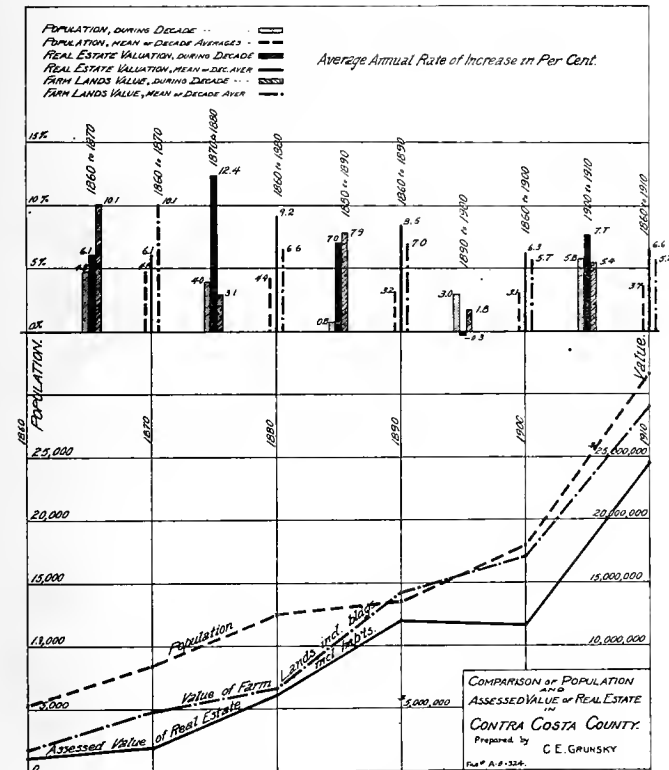
Decade	California	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa
Per Cent in the Decade						
1860-70	47.4	163.1	106.4	120.3	171.5	58.8
1870-80	54.3	56.5	30.7	33.5	59.8	48.0
1880-90	40.3	27.8	16.4	37.0	49.0	7.9
1890-00	22.4	14.6	19.8	25.4	38.7	33.5
1900-10	60.1	21.6	119.8	38.7	89.0	75.5
Per Cent per Annum						
1860-70	4.0	10.0	7.5	8.2	10.5	4.8
1870-80	4.4	4.5	2.7	2.9	4.8	4.0
1880-90	3.4	2.5	1.5	3.2	4.1	0.8
1890-00	2.0	1.4	1.8	2.3	3.3	3.0
1900-10	4.8	2.0	8.2	3.3	6.6	5.8

If assessors' valuations for taxation purposes be accepted as the basis (however unsatisfactory this may be for individual years) for determining the periodical increase in the value of real estate, the result will be as shown in Table 4. The figures representing tax values are as reported by the several county assessors or as modified by the State Board of Equalization and published in the reports of the State Controller.

TABLE 3

Population Growth
California and South Bay CountiesMean of the average annual percentage rates of increase in the
several decades since 1860

	California	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa
1860-70	4.0	10.0	7.5	8.2	10.5	4.8
1860-80	4.2	7.2	5.1	5.5	7.6	4.4
1860-90	3.9	5.7	3.9	4.8	6.5	3.2
1860-10	3.5	4.6	3.4	4.1	5.7	3.1
1860-10	3.7	4.1	4.3	4.0	5.9	3.7
1870-80	4.4	4.5	2.7	2.9	4.8	4.0
1870-90	3.9	3.5	2.1	3.0	4.4	2.4
1870-00	3.3	2.8	2.0	2.8	4.1	2.6
1870-10	3.7	3.5	3.5	2.9	4.7	3.4
1880-90	3.4	2.5	1.5	3.2	4.1	0.8
1880-00	2.7	2.0	1.6	2.7	3.7	1.9
1880-10	3.4	2.0	3.8	2.9	4.6	3.2

Chart showing comparison of the growth of population with the
assessed value of real estate in Contra Costa County

In Table 5 comparisons are made between the rate at which population is increasing in the bay counties with the rate at which the taxation value of real estate is increasing.

TABLE 4

Valuation for Taxation Purposes
San Francisco Bay Counties
Real Estate and Improvements

Year	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa
1860	25,125,800	996,400	2,584,700	2,290,700	1,050,900
1870	75,146,000	1,533,450	8,733,900	9,621,700	1,903,900
1880	165,024,000	5,520,800	21,451,800	40,314,500	6,128,200
1890	235,362,000	12,332,500	45,852,600	69,649,500	12,049,700
1900	288,531,000	11,902,400	46,027,100	75,028,100	11,660,100
1910	433,263,000	24,569,000	64,399,000	174,099,000	24,572,500
1915	470,077,000	28,267,000	65,885,000	207,447,000	

Real Estate exclusive of improvements

Year	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa
1900	190,457,000	8,503,000	32,130,000	47,856,000	8,777,850
1901	192,447,200	8,554,000			
1902	191,804,500	8,633,000	31,894,500	50,006,000	
1903	201,508,000	9,970,000			
1904	293,500,000	10,360,000	33,657,000	56,516,000	
1905	304,136,185	10,917,000			
1906	237,083,000	11,981,000	35,199,500	61,526,500	
1907	260,689,800	15,322,000			
1908	258,651,000	16,542,000	37,620,500	106,901,500	
1909	283,169,000	17,256,500	42,285,000	120,278,000	
1910	288,095,452	17,413,000	44,478,000	110,964,000	
1911	288,653,700	19,020,000	42,969,000	110,309,000	19,669,300
1912	323,715,060	19,293,000	42,877,000	131,675,000	17,217,000
1913	323,305,105	19,600,000			
1914	326,057,234	19,979,220	43,041,000	146,022,000	
1915	327,409,600				

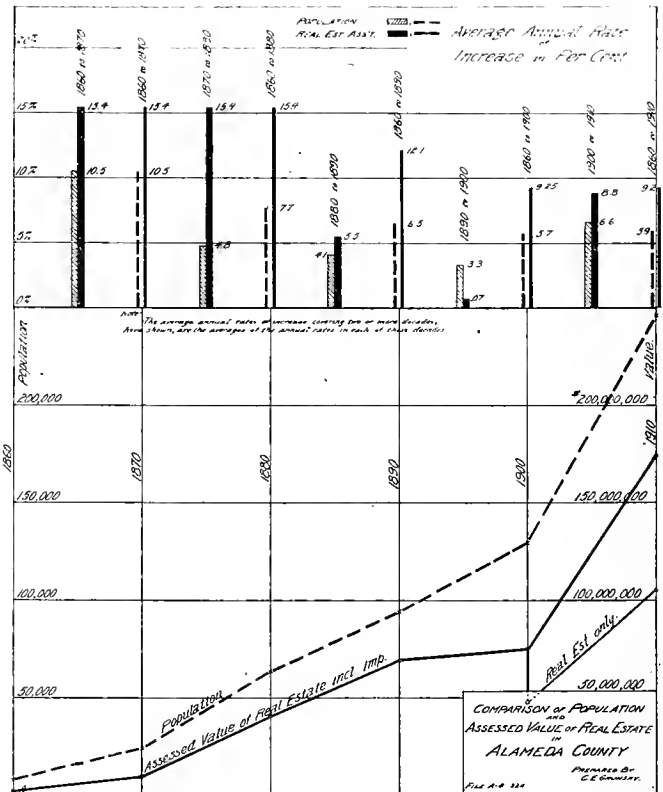
Chart showing comparison of the growth of population with the
assessed value of real estate in Alameda County

TABLE 5

Comparison of the Rate of Population Growth with the rate of
increase of the Valuation of Real Estate for taxation purposes
San Francisco Bay Counties

Average increase per year in percentage

Period	San Francisco		San Mateo		Santa Clara		Alameda		Cont.Costa	
	Popul.	Tax Val.	Pop.	Tax Val.	Pop.	Tax Val.	Pop.	Tax Val.	Pop.	Tax Val.
1860-70	10.0	11.6	7.5	4.5	8.2	13.0	10.5	15.4	4.8	6.1
1870-80	4.5	8.2	2.7	13.7	2.9	9.4	4.8	15.4	4.0	12.4
1880-90	2.5	3.6	1.5	8.3	3.2	6.5	4.1	5.5	0.8	7.0
1890-00	1.4	2.1	1.8	-0.3	2.3	0	3.3	0.7	3.0	-0.3
1900-10	2.0	4.2	8.2	7.5	3.3	3.3	6.6	8.8	5.8	7.7
1870-80	4.5	8.2	2.7	13.7	2.9	9.4	4.8	15.4	4.0	12.4
1870-90	3.5	5.9	2.1	11.0	3.0	7.9	4.4	10.4	2.4	9.7
1870-00	2.8	4.6	2.0	7.2	2.8	5.3	4.1	7.2	2.6	6.4
1870-10	2.6	4.5	3.5	7.3	2.9	4.8	4.7	7.6	3.4	6.7
1880-90	2.5	3.6	1.5	8.3	3.2	6.5	4.1	5.5	0.8	7.0
1880-00	2.0	2.8	1.6	4.0	2.7	3.2	3.7	3.1	1.9	3.3
1880-10	2.0	3.3	4.5	5.2	2.9	3.2	4.7	5.0	3.2	4.8

The valuations in the foregoing tables cover all the real estate in each county. A more rapid increase of value at the population centers was suspected than throughout the farming and grazing districts of the several counties. To obtain some light on the question of whether outside lands, lands not within incorporated areas, were increasing at the average county rate, the values of farm lands as reported by the U. S. census were examined.

These values bear out the conclusion that the value of outside real estate too is increasing with increasing population and generally at a slightly higher rate. Without including in this statement the actual figures of farm land values as they appear in the census reports, attention is called to the diagrams 1 to 6 on which these farm land values for the counties San Mateo, Santa Clara, Alameda and Contra Costa, and rates at which their value is increasing are shown in comparison with similar information relating to population and the taxation value of all real estate and improvements.

In using these diagrams, as in the case of the tables, it should be remembered that the outside or farm land areas are being continually encroached upon

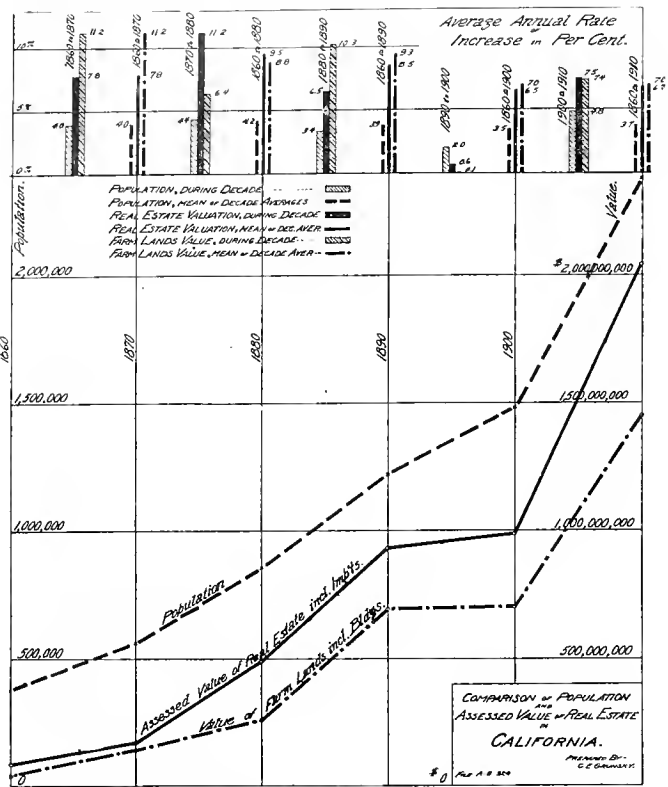


Chart showing comparison of the growth of population with the assessed value of real estate in the state of California

by cities and towns. The acre property nearest to the population centers and therefore the most valuable of the outside land may in the interval between two of the years for which aggregate value is noted have been subdivided into lots and made a part of some municipality. If such areas could have been included in the comparison of outside land valuations, the rates of increase in valuation would no doubt appear slightly higher than shown in the tables and diagrams.

The taxation value of real estate and improvements in California as obtained from the published reports of the State Controller are presented in Table A.

TABLE A California Assessed Valuation of Real Estate and Improvements From Reports of the State Controller						
Year	Assessed Valuation	Increase Per Cent in preceding 10 yrs.	Increase during preceding 10 yrs.	Percentage per Year		
				Decade Aver. since 1860	Decade Aver. since 1870	Decade Aver. since 1880
1850	42,702,000					
1860	79,820,000	87.	6.5			
1860	79,824,000	87.	6.5			
1870	169,537,000	112.	7.8	7.8		
1880	491,885,000	190.	11.2	9.5	11.2	
1890	931,648,000	89.	6.5	8.5	8.3	6.5
1900	988,984,000	6.	0.6	6.5	6.1	3.5
1910	2,038,650,000	106.	7.5	6.7	6.4	4.8
1916						

The cash value of farm lands, including buildings, has been estimated and is reported upon in the U. S. census publications. From these the values presented in Table B for the farm lands of California were compiled.

With information at command relating to the rates at which the value of real estate is advancing, some consideration will naturally be given to cost,

TABLE B State of California Cash Value of Farms, including Buildings From U. S. Census Reports						
Year	Value of Farms incl. Bldgs.	Increase Per Cent in preceding 10 yrs.	Increase, Percentage per year during preceding 10 yrs.	Decade Aver. since 1860	Decade Aver. since 1870	Decade Aver. since 1880
1860	48,726,804					
1870	141,240,028	190.	11.2	11.2		
1880	262,051,282	85.	6.4	8.8	6.4	
1890	697,116,630	166.	10.3	9.3	8.3	10.3
1900	707,912,960	1.4	0.1	7.0	5.6	5.2
1910	1,450,601,488	105.	7.4	7.0	6.0	5.0
Land only						
1900	630,444,960					
1910	1,317,195,448	109.	7.7			

when reservoir lands are to be valued as a basis for fixing the rates to be charged by any public utility whose business involves the use of reservoirs. Such consideration is all the more important because of the difficulty of bringing the various factors affecting value of reservoir land into any satisfactory relation to its value. In analyzing cost it is necessary not only to ascertain the original actual cost, but also the time of the acquisition of the property. If this be not too remote the cost data, with proper allowance for appreciation, like any sales of similar lands, may be used as an index, more or less dependable of present value.

It should be remarked in passing that the decision of the courts, that value should be used as a basis for rate regulation, are followed in this discussion, a view to which the writer takes exception, as explained in other articles of this series, and that in this discussion land value as an increment of the rate-base is, therefore, considered to be determined just as value would be determined in condemnation proceedings.

ELECTRIC POWER DEVELOPMENT IN UTAH
BY W. R. PUTNAM

The availability during recent years of economical electric power for the factories of Utah has played a most important part in the development of the state's manufacturing establishments and the utilization of Utah's natural resources.

Less than five years ago a score or more of small electric companies each acting individually, were trying their level best to generate and distribute sufficient electrical energy to meet a rapidly growing demand for economical and dependable electric power in this section of the intermountain west.

The welding together of the generating and distributing plants of these small concerns and the creation and development of a modern and unified system of hydroelectric power plants capable of supplying the homes and factories, stores and mines and mills throughout northern and central Utah and western Colorado, forms one of the most important factors in the recent history in the development of the intermountain west and the utilization of natural resources throughout this great stretch of territory.

For twelve months ended July, 1917, the Utah Power & Light Company expended for construction and operating wages only, in the territories served, \$2,399,062. Sixty-one thousand customers were served.

There is no more interesting phase of the company's operations than the important factor of its work among Utah manufacturers.

Practically every large manufacturing institution in the state today is electrically operated.

FUEL OIL AND STEAM ENGINEERING

BY ROBERT SIBLEY AND CHAS. H. DELANY

(The exact measurement of the heating value of oils is a matter of prime importance in fuel oil and steam engineering practice. In this article the authors first establish mathematical formulas for computation of the heating value of oil when the chemical analysis is known. A description of the use of the fuel oil calorimeter follows which brings in a detailed illustration of how the computation is made when the calorimeter test has been performed.—The Editor.)

DETERMINATION OF HEATING VALUE OF OILS

To determine the efficiency of boiler operation it is necessary to know the heat producing value of the oil used in firing. Again, since oil is usually sold commercially by the barrel, the heat producing value of the product must be known in order that the engineer may ascertain the economic value the product may prove to his client in its use in the power plant for the generation of steam.

An Approximate Method Based on the Baume Scale.—The heat producing value of oil is usually ex-

$$H = 17680 + 60 B \dots \dots \dots (1)$$

Thus in analyzing a composite sample of forty samples of Kern River oil, the United States Bureau of Mines found that its calorific value was 18562 B.t.u. per lb. of oil, in which the oil had .5% moisture, and that the Baume reading of this oil when free from water was 14°.78. According to the formula above, which was first announced by Professor Joseph N. LeConte of the University of California, the heating value of this oil when free from moisture should be

$$H = 17680 + 60 \times 14.78 = 18,566 \text{ B.t.u. per lb.}$$

In this instance then it is seen that this approximate method checks with considerable accuracy, since the water-free oil showed by actual test to have a heating value of 18,658 B.t.u. per lb. In the utilization of this formula, however, it must be remembered that the oil must be taken as anhydrous, or in other words that the oil sample is moisture free.

Dulong's Formula Based on the Ultimate Analysis.—The second method of arriving at the calorific value of crude petroleum is by means of Dulong's formula. This formula is based upon the ultimate analysis of the oil in which the heat value of carbon, hydrogen, and sulphur are taken into account.

In the burning with oxygen of one pound of carbon, one pound of hydrogen, and one pound of sulphur it has been established experimentally that 14600, 62000, and 4000 B.t.u. of heat energy are respectively given out. Hence it is evident that if a one-pound sample of fuel oil has C proportions by weight of carbon, H proportions of weight of hydrogen and S proportions by weight of sulphur, the total heat given out by the one-pound sample will be

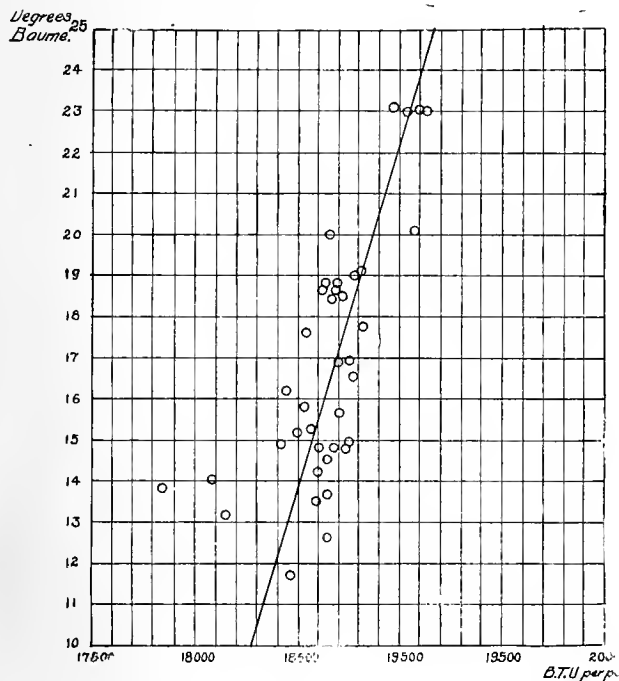
$$H = 14,600 C + 62,000 H + 4000 S$$

In the chemical analysis of fuels a certain amount of oxygen (O) is always encountered. This of course kills, as it were, its combining weight of hydrogen. Since oxygen unites with one-eighth of its weight of hydrogen, the net hydrogen available for heat generating purpose is $(H - \frac{O}{8})$.

$$\text{Hence we have Dulong's formula}$$

$$H = 14,600 C + 62,000 (H - \frac{O}{8}) + 4000 S \dots (2)$$

For California oils, Dulong's formula seems to indicate a heat value per pound of about 5% in excess of the true value. In other words, it indicates a heating value of about 19,500 B.t.u. per lb. of California crude oil, while a great number of calorific tests have



THE GRAPHIC LAW FOR CALORIFIC VALUE OF FUELS

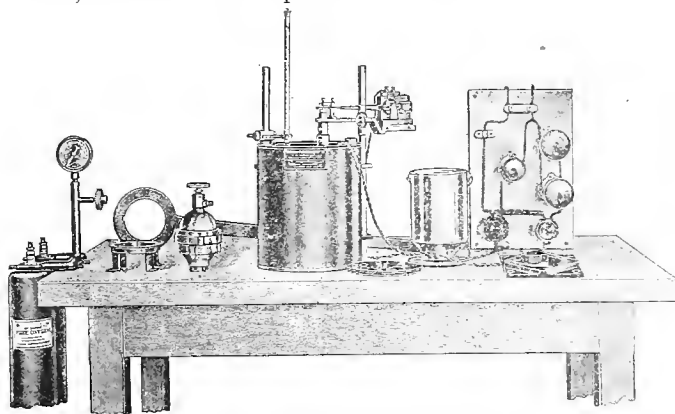
In this illustration is shown how a large number of experimental values often enable the engineer to ascertain an empirical law for setting forth experimental data. By plotting the heat determinations for fuel oil against their gravity expressed in Baume readings, the experimenter deduced an equation for determining the calorific value of water free oil when its gravity Baume is known.

pressed in the number of heat units per unit of mass that the oil will give out when it is completely burned in a furnace. In engineering practice this is usually expressed in B.t.u. per pound of oil so burned.

There are various methods of ascertaining this value. An approximate method is that based upon the gravity of the oil. To establish this method a large number of samples, in which the gravities of the oil free from moisture were expressed in Baume readings, were accurately determined as to their heating value. These values were plotted on a chart and it was found that the following relationship is approximately true in which H represents the heat units in B.t.u. liberated per pound of fuel burned.

shown that the average value is about 18,500 B.t.u. per lb.

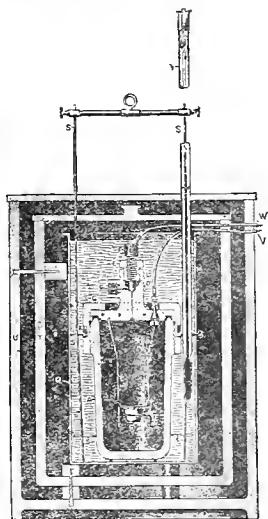
The Fuel Calorimeter.—The most accurate method of determining the heating value of a sample of oil is by the employment of some form of calorimeter, wherein a sample of definite mass is burned



THE EMERSON FUEL CALORIMETER

In this type of calorimeter the fuel sample is placed in the bomb, the bomb inverted, as shown in the sketch, and filled with oxygen which is accomplished by means of the spindle valve at the top of the bomb. After filling the calorimeter with distilled water and firing the sample by means of an electric circuit, the rise in temperature of the water in the calorimeter is ascertained, and the calorific value of the fuel thus determined.

and the heat given out ascertained. The fuel calorimeter is an entirely different instrument from the steam calorimeter used for measuring the moisture of steam, which was described in an earlier chapter. The fuel calorimeter is a true instrument for measuring heat, as its name implies. Calorimeters in general may be divided into two classes, the one known as the



THE ATWATER-MAHLER BOMB CALORIMETER

This type of calorimeter is applicable to the highest scientific work. It permits of determining the exact amount of water and carbon dioxide in the products of combustion, thus enabling the error due to the condensation of the water in the bomb to be overcome and therefore making it possible to calculate the exact amount of heat the fuel should produce under boiler conditions.

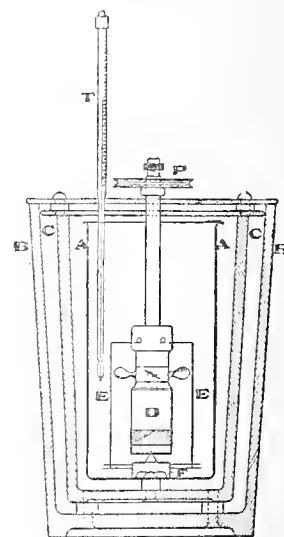
continuous method and the other as the discontinuous method. In the former instance a sample is continually burned, and the average results ascertained over a considerable period. This method is only applicable for gases and some unusual types of oils. The discontinuous process is on the other hand the most advantageous for the determination of the heating value of crude petroleum.

Several methods are employed in the application of the discontinuous calorimeter. Most forms of such

calorimeters consist essentially of a strong combustion chamber with a crucible for holding the sample; valves for charging the chamber with oxygen in order to properly burn the sample; a method of igniting the sample; and a vessel of water in which the bomb or explosion chamber is immersed in order that the resultant heat may be absorbed by this water and thus carefully measured. This latter vessel is usually situated in a second compartment which serves as a jacket. The main principle upon which such calorimeters depend is based upon the fact that the burning of carbon, hydrogen, and sulphur with an artificial supply of oxygen presents the most accurate method of liberating the latent heat in the fuel and the ascertaining of its quantitative proportions. Types of this calorimeter familiar in the market are known as the Mahler, the Hempel, the Atwater, the Emerson, and the Carpenter.

The Parr Calorimeter.—In the commercial determination of the heating value of crude petroleum, however, it is often inconvenient to secure oxygen under the proper pressure required for the successful operation of this type of calorimeter. In recent years there has appeared upon the market a much simpler design of calorimeter which seems to have sufficient accuracy for most commercial uses and is indeed quite simple in operation. This is known as the Parr calorimeter and is the invention of Professor S. W. Parr of the University of Illinois.

The Principle of Operation.—In the Parr calorimeter a definite mass of oil is introduced into a strong cylinder of metal called the cartridge, along with some accelerator together with a measure of potassium peroxide. The potassium peroxide furnishes oxygen



CROSS-SECTIONAL VIEW OF THE PARR CALORIMETER

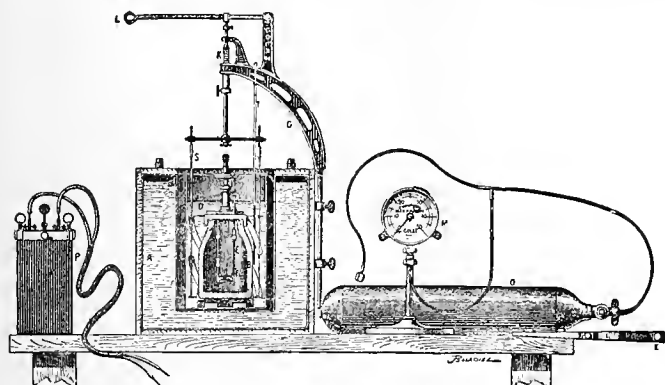


THE PARR CALORIMETER UNASSEMBLED

In this type of calorimeter a carefully weighed oil sample is burned with a chemical agent without the use of free oxygen. The ease with which it may be manipulated commends its use for commercial application. For scientific work, however, a type of the Bomb calorimeter is to be preferred.

for combustion and the accelerator, which is usually potassium chloride, insures that all the fuel may be burned. The ignition is effected electrically by the burning out of a fine iron wire immersed in the mixture.

As shown in the illustration, the cartridge D, in which the sample is placed, is closed up, inserted into a can of water A, and the whole placed in a fibre ves-



THE MAHLER BOMB CALORIMETER

This type of calorimeter represents one of the most accurate for the determination of the calorific value of fuel oil. The bomb is of enameled steel. The burning of the oil sample is accomplished by supplying an outside source of oxygen as in the Emerson Calorimeter.

sel B, which thus brings about careful heat insulation. After causing an explosion by means of an electrical contact spark in the cartridge D, the cartridge is given a rotary motion by means of the pulley P and the heat which is given out from the cartridge due to the burning of the ingredients is rapidly absorbed by the water in the vessel A. If then we know the mass of the sample burned, and the mass and temperature of the water before and after the explosion, we can compute the heat value of the fuel.

Detailed Operation of the Parr Calorimeter.—Let us now go into the details of this calorimeter operation. A well lighted closet should be used for all calorimeter work so that air currents which might otherwise prevent uniform radiation can thus be eliminated. The outside of the calorimeter cup and of the fibre insulating case should be entirely free from moisture for the same reason. The calorimeter cup A is filled with 2000 grams of water. The cartridge or bomb in which the sample is placed has a water equivalent of 135 grams; that is, it absorbs the same amount of heat as 135 grams of water would under the same range of temperature. Hence, the total water equivalent W_e is 2135 grams. As the mass of oil is also determined in grams, the water equivalent W_e divided by the mass of oil fired, W_o , becomes an abstract ratio, and, if this ratio is multiplied by the rise in temperature of the water in degrees Fahrenheit, the result is heat units per pound of oil, or, if the temperature is expressed in degrees Centigrade, the result becomes calories per gram.

The water is best measured in a 2000 c.c. flask. About 2003 c.c. of water are used instead of an exact 2000 c.c., since the specific gravity of water at ordinary room temperatures is slightly less than unity and this increased volume is necessary to measure weights volumetrically.

The thermometer which is employed in temperature measurements has a range of from 65°F. to 90°F. and is standardized by the Bureau of Standards at

Washington. Graduation errors are known to within .01°F. The thermometer scale is divided to .05° and with care may be read to .005°. The greatest chance for error in fuel calorimeters is in reading temperatures, since it is difficult to avoid parallax. Consequently as the rise in temperature seldom exceeds 5°, an error of .01° is equivalent to .2% error in the work.

Preliminary Precautions.—Before placing the sample, the cartridge should be wiped clean and dry, as moisture will condense on it if it has been standing for some time. The top and bottom pieces, as well as the gaskets and electrical terminals, should be dry, since the moisture on them takes part in the chemical reaction and thus introduces considerable error. The cartridge should be tightly assembled, and 1.500 grams of accelerator (potassium chloride), weighed to the nearest reading of .005 grams, placed therein. The oil is weighed in a small flask with an eye dropper and about .04 to .05 grams (8 to 12 drops) dropped into the cartridge upon the accelerator which absorbs the oil. Upon reweighing the flask of oil and the dropper, the net weight of the oil sample is at once obtained. A measure full of sodium peroxide is added and the contents thoroughly mixed with a stiff wire. With care no oil and very little peroxide will adhere to the wire. The sodium peroxide should be supplied by the calorimeter manufacturer, as inferior grades are apt to supply variable and detrimental products of combustion.

About 3 in. of No. 4 iron wire for firing the charge are next looped on the firing terminals and tested out to insure a good electrical contact. The firing current is usually supplied by a few dry cells or from a storage battery.

The stem of the bomb is next fastened in place and the vanes attached. The cartridge is placed in the calorimeter cup, the cover and pulley attached, and the cartridge stirred by a small motor for about five minutes. The motor may be of the toy variety and is usually placed in the lighting circuit with a lamp resistance. The electric circuit is controlled with a two-throw switch so that the motor may be cut in and out without interfering with the illumination in the closet. The motor speed should be as nearly constant as possible, since a variable speed will cause a variable rate of radiation from the calorimeter. The rotating bomb should have from 100 to 150 revolutions per minute.

The Explosion of the Charge and the Taking of Temperatures.—The thermometer is next placed into the water bath through a hole in the cover and should be supported so that it does not touch the metal cup which contains the water. After a steady initial temperature has been reached, the firing circuit is completed through the pulley, and the resulting temperatures read every minute for the succeeding ten minutes, in order to ascertain the correction to be made for uniform radiation. This series of readings is taken in order to ascertain the law of radiation and then to make a proper correction for the error involved.

Thus, for a period of about five minutes the temperature will rise until a maximum is reached, after which it will begin to fall. The radiation during the first five minutes is assumed to be at the same rate as that observed during the entire radiation period.

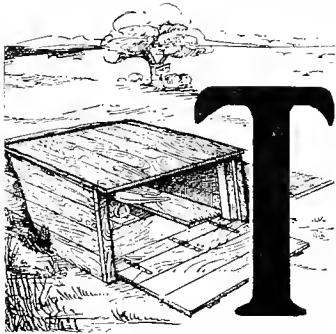
BUSINESS BUILDING
SELLING IDEAS
DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS
COST KEEPING
ESTIMATING

TRAPSHOOTING BY ELECTRIC LIGHTS

(The good marksmanship of our army is attributed to the familiarity with the gun possessed by so many Americans. The prolonging of the hours in which that marksmanship may be practiced by the proper illumination of ranges and targets is therefore, not only adding a further interest to the sport, but performing a patriotic service. Is the gun club in your city properly fitted out for night time practice?—The Editor.)



AN AUTOMATIC TRAP

The targets are sprung from a trap house, by an automatic trap or a hand trap.

TRAPSHOOTING by electric light is the latest dish to be added to the sporting menu.

Golf, tennis, baseball and track athletics—from sprinting to marathon races—have been tried under the powerful rays of the calcium without adding anything to their popularity; yet there are those who believe that trapshooting is destined

to become a more important factor in the world of sport through the medium of artificial light.

There are many who find it an extremely difficult task to shatter the clay targets with daylight in abundance; and these people, quite naturally, will not star or become famous through their efforts under electric light. No matter how good the lighting system may be it won't come up to the quality of light furnished in the daytime—every day.

During the past few months quite a number of these trapshooting tournaments after nightfall, under electric light, have been held, and every one has been successful. On Venice Pier, Los Angeles, Cal., more than 100,000 targets were thrown in two months. Here the shooting was done with 20-gauge guns. The only criticism at Venice was that there wasn't room enough for all those who desired to shoot.

The first shoot ever held under the calcium lights was conducted by the Jacksonville, Ill., gun club several years ago, and then the Salem, N. J., yacht and gun club introduced the sport in the east. Around Salem way, Illinois is considered in the west, but in what is really the west, Illinois is considered in the east.

Anyway, Salem had a corking shoot. They had lights over and behind the shooters, lights on the side of the traphouse which threw rays outward and upward; two stereopticon lights 16 yards behind the shooters and 12 feet high, one light being thrown above the other so that a greater area of space could be covered. Every target was visible until it fell.

The Chicago, Illinois, gun club staged an electric light carnival which was considered just the thing.

There were six flood lights, each lamp fitted with a 1000-watt tungsten. Each lamp projected an unwavering light over 8800 square feet of space. These lights were mounted on the clubhouse and pergolas, and the grounds were as bright as day.

The Evanston, Illinois, gun club used eight acetylene lamps erected 6 feet in front of the traphouse, 2 feet apart, in a semi-circle, with additional lights behind and over the shooters' heads. To make the targets even more visible they were whitewashed, and they at once were called "ghost targets."

Other cities that have tried trapshooting under electric light, and liked the sport are Clarksville, Ia., Portland, Ore., Newark, Cal., and Yorklyn, Del.

In some places where the lighting facilities are not of the latest improved type it is necessary that



TRAP SHOOTING FROM A PIER

This particular scene is in New York, but a similar position on the Venice Pier at Los Angeles has provided very satisfactory night shooting when properly illuminated.

one be a snaphooter in order to "bust" the targets. It is a sport where "he who hesitates is lost."

It is obvious that in order to obtain good results in the shooting, the gunsights as well as the targets must be properly lighted. For this reason the problem is not simply one of turning a searchlight or two in the direction of the traps. The factor of expense enters into the question of flood lighting and in the interests of economy various ingenious schemes for placing the lights have been worked out.

In view of the fact that practically every city of any size in the west has at least one gun club and that besides the daily practice, the ranges are used for annual district and national meets, it seems as though there might well be a field here for the spreading use of electricity.



"SANTA AND THE WONDERFUL GENIE"
Scenes from the advertising film under that title

AN ELECTRICAL CHRISTMAS

Some years ago, Thomas Edison predicted that it wouldn't be very long before practically everything that required labor in the home would be done by electricity.

Every one knows to what extent labor, time and money saving electrical appliances have been introduced into the home, and how energetically and successfully central stations, electric shops, contractors and others have been promoting the use of such devices. But it has been only with the sudden descent of war upon this country that the full meaning of Edison's words, and their great portent comes to us.

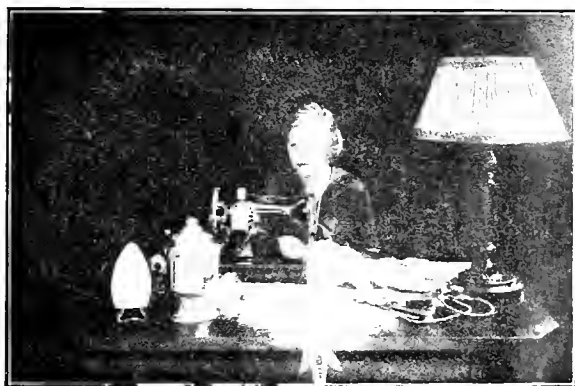
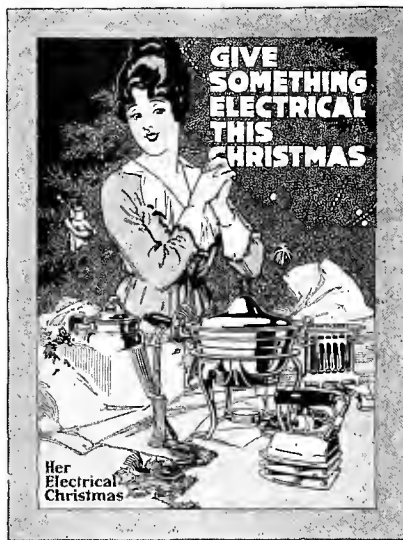
Apropos of this question of selling electrical appliances, this year's campaign of The Society for Electrical Development, "America's Electrical Christmas" comes along at a most opportune time. Never before in the history of the industry was there a time when electrical merchandise played the part it will this year. Nor was the time ever more propitious for the electrical dealer than this season. The sale of electric appliances is not only the best thing the merchant can do for more business—and more profits—it is practically the only thing.

These facts, and others, have all received the most careful attention in a book just published by the Society, which is being sent gratis to members and non-members alike, upon request. It is designed for

Central Stations and dealers who have arrived, those who are Already There, those who are Going, and the Just Started. It is a big book, 48 pages and cover, and is attractively printed in many colors, profusely illustrated throughout, and filled with practical, timely suggestions, built for stores of all sizes in cities of all sizes.

The book has some twenty chapters, treating on everything from the store and window display, to the use of two very excellent movie films which the Society has prepared, in co-operation with the Universal Film Manufacturing Company. "Santa and the Wonderful Genie" and "The Home that Runs by Magic" are titles to appeal to any audience. The motion picture is a super-salesman. It reaches more people than any other medium in the world—and reaches them when they are in a relaxed and receptive mood. A message in the

tion picture is a super-salesman. It movies will be seen and understood. There is room on each film for your own name and business trade mark—and you will find that your local theatre will run the films at small cost. All the helps, copy, cuts, etc., are furnished practically free to members and non-members along the same broad liberal policy heretofore manifest in such previous campaigns as America's Electrical Week, Electrical Prosperity Week, Wire-Your-Home-Time, etc. Readers are advised to correspond with The Society for Electrical Development for full information and aid.



"THE HOUSE THAT RUNS BY MAGIC"
A moving picture to show your customers the electrical devices in actual use

THE JOBBER'S STANDPOINT

BY J. I. COLWELL

(Every branch of the electrical industry has its legitimate place—manufacturer, jobber and contractor-dealer. This offer of co-operation and suggestion of definite avenues of helpfulness came from the Seattle manager of the Western Electric Company at the recent convention of Oregon Contractor-Dealers at Eugene.—The Editor.)

The electrical jobbers have spent a great deal of time and money fostering co-operation. After the jobbers had built up their own association they discovered that in order to secure the best results for the entire industry they must help organize the contractors and dealers. The jobber believes in the distribution of his goods through the contractor-dealer to the consumer and has no intention of jumping over his head and distributing the goods direct.

There are of course, always some elements in the electrical business who do not seem to work with the other branches of the industry, or along broad lines, and who operate on the day-to-day policy, having in mind only the immediate dollar which they can secure from their business. In this class are some distributors who sell material of an inferior make at a price lower than they can afford to sell, if they really knew their costs, and they occasionally secure and sell small quantities of standard material at practically their cost. They supply principally the irresponsible contractor who has had but little practical, and no business experience, does not know how to accurately figure his cost on a job, is satisfied with a profit equal to the wages of one of his wiremen, and is constantly undermining the business of the responsible contractor who has had enough practical and business experience to estimate work so as to make a fair profit on it. That kind of a distributor of electrical material is manifestly inimical to the success of the responsible contractor, for he supplies ammunition to the irresponsible contractor to fight you with.

The responsible jobber should not, and does not, encourage the ultimate consumer to do his own electrical wiring or installation work, and adherence to that policy will check any tendency to disorganize the present contractors' business. There are, however, large plants, maintaining an electric engineer with a large amount of constant maintenance work who will not suffer the inconvenience of having outside concerns take care of their electrical equipment, and when they are big enough to buy supplies in quantities about the same size as the electrical contractor they will doubtless deal with the jobber, and many of them when purchasing large apparatus are averse to recognizing even the jobber's right to a profit.

The electrical material purchased by a few large industrial plants enters into their product (varying all the way from a ship to a motor-driven ice cream freezer), which they manufacture for sale, and this class of industrial is entitled to as good a price consideration from the jobber as a contractor. Just as some large central stations in the maintenance of their plant seek to obtain their power equipment direct from the manufacturer.

There are, however, manufacturing industries which have suddenly come into existence that use electrical material in their product, and because of their lack of organization, offer opportunity for the

electrical contractor for construction and wiring work. About all a jobber can do in a case of this kind, where he finds the contractors trying for the electrical work, is to exert his efforts in any way that he can to help them get the job.

This is really the first generation of electrical contractors in the Pacific Northwest, and the majority of them have not even inherited a bookkeeping system or cost system, because they did not, in most instances, purchase the business, but started it themselves after a few years of experience as a foreman for some other contractor, or after being in the employ of a central station.

When this is considered, the men in the electrical contracting business are really to be congratulated that their business is in as good shape, and on as high a plane, as it is.

There is no question as to the recognized standing of the contractor-dealer as the proper channel for the distribution of the electrical supplies to the consumer, and even though this position is a comparatively new one, it is a permanent one and should be an independent one. The electrical contractor undoubtedly aims to be a business man running his own business and independent of a jobber or manufacturer, in securing his contracts, installation, or other business.

The jobber maintains a selling organization to actually sell the five thousand or more different items of electrical merchandise which he stocks, for regardless of the pleasing personality of the usual representative of the factory, knowledge of his line and other valuable technical information given by him to the trade on his occasional visits, those who buy or are in the market for electrical material go to the jobber for the information as to what they need, because of his experience in the electrical business.

The manufacturer or his representative has a big job to perform if he makes sure that the sales manager and the salesmen of the jobbing houses that sell his goods actually know his material, what kind of work it is particularly fitted for and everything there is to know about its construction and uses. Any jobber is willing to give the representative of the manufacturer all the time he will use in this kind of work with his salesmen.

This method of thoroughly establishing their lines with the jobber is not followed out by many manufacturers, but is one way in which the manufacturers and jobbers can work together to their mutual advantage and to the advantage of the industry. This is really educational work, but business and technical education seem to be greatly needed in the electrical industry. A realization of that must have been in the minds of the leading electrical men of the country when they founded the Society for Electrical Development which backed and promoted "Electrical Prosperity Week" and "America's Electrical Week."

It has been said that these campaigns to educate the public have developed business principally for the central stations. This may have seemed true at first glance, but when the public wants additional electrical appliances and equipment, the central station wants the contractor to do the additional electrical wiring, and he wants to use the jobber's stocks of appliances and other material.

We can all well afford to co-operate with the central stations in educating the public to a better realization of what electric conveniences are available, and a more thorough knowledge of the practical application of electricity. Advertising is, of course, accomplishing very much in this education, and is constantly developing business for all of us. An example of the educational and co-operative work being done by the Society for Electrical Development is shown in their pamphlet entitled "Why You Should Patronize a Responsible Contractor." This lines up in a series of effective advertisements the good reasons why the public should patronize a responsible contractor. It could be used to advantage either as individual advertising, by a contractor-dealer, or by all the responsible contractors in a town, sharing the expense and all having their names run underneath the advertising copy.

The co-operation of the different branches of the electrical industry has not only brought about the transfer from jobber to contractor of the distribution of electrical supplies to the consumer, but the wiring of residences and buildings, the running in of the service for electric ranges, installation of motors, and in some places, the selling of lamps is now recognized throughout the country as contractor-dealer business. When a demand is created for new electrical devices and when a permanent market is assured for them, we believe that the central station is willing and aims to discontinue the sale of them, provided the contractor-dealer is properly equipped and situated to serve the public, so that all of these devices which the public are willing to buy will reach their lines and consume their current. We do not believe that the market for the electric range has been sufficiently developed, or the demand for it sufficiently popularized, or that the contractor-dealer has an organization adequate to push the sale of it and properly follow it up after the sale, for the central station to turn over its distribution to the contractor-dealer; but is not the contractor-dealer equipped to handle the sale of lamps and would not the central station be better off if they were not bothered with the warehousing and distribution of lamps?

There are, I suppose, many instances where the contractor looks over the plans of a home or apartment house with the owner and does not find any base board outlets, or floor outlets to connect portable lamps, percolators, toasters, warming pads, irons, air heaters, and other household necessities, or he does not find that it is planned to wire the kitchen for an electric range. Electrical appliances have a great deal to do with the convenience and attractiveness of a house or apartment, and owners are susceptible to arguments for additional electrical equipment, and if you handle the matter properly, not only the size of the contract will be increased, but you will most likely also sell the devices for which the extra outlets are made. This is also good co-operation with the central station, jobber and manufacturer.

We all need the support of the central station in our problems, just as he needs the loyalty of every man in the electrical business. His success means our success, and every wireman, contractor, jobber and manufacturer should go out of his way to boost for, and defend, the central stations, both in helping them

get more of a load on their lines, and in being sure that their side, provided it is fair and reasonable, of any public controversy is well understood.

There can be no doubt about the proper growth of the industry if the different branches of it co-operate consistently with each other, and we all have for our motto "The fair treatment and proper serving of the consumer."

THE MODERN ELECTRICAL CONTRACTOR-DEALER

BY W. M. DEMING

The successful electrical contractor or dealer of the future must be master of his craft. He must be able to advise and suggest new ideas and be up to date in every respect for—other things being equal—the business will come to the one who can offer the best suggestions and give the best service.

He will profit materially by cultivating the friendship and seeking the advice of the local lighting and power company's representatives; also don't overlook the salesman on the road, for often valuable ideas and suggestions come from the most unexpected sources and it all tends to build up a spirit of reciprocity—which is still another way of saying co-operation.

Again, a dealer who purchases and sells only what his trade calls for is a dead one. He must carry staples, of course, but he should always be on the alert for new ideas that will attract the public.

Just a word about the contractor-dealer who keeps his place of business looking like a junk shop, all sorts of odds and ends scattered about, office and show rooms untidy, etc. Consider the lighting company's office and show rooms or your competitor's neat and tidy place of business. To which would ladies or business men go first?

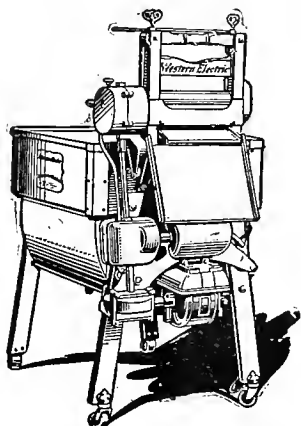
I am satisfied that price does not occupy an important place in the selling game. Salesmanship is, in fact, destroyed just in proportion as the question of price figures into the bargain. Furthermore the reputation—the good name and the success of a business concern—is as much or more in the hands of its employees who come into direct contact with the buying public as it is with the owners or executives. The customer offended by an employee is offended at the company. On the other hand the customer pleased and satisfied with an employee's treatment is a friend and boosts for the company. It is, therefore, just as important that employees be trained to render proper service as it is for the heads of a business to give efficient service. Train them to keep their eyes, ears and minds open for new ideas and prospective business.

Just another thought. The right hand of salesmanship is advertising, either through personal suggestion or in the newspapers. No better opportunity for building up your business exists today, but it must be done properly. To sell many items that you handle successfully it is first necessary to create the desire for that thing in the minds of the public. In other words, you must first sell the idea. You can therefore devote much time to a study of effective advertising. The assistance of your local lighting company is of great value in this respect.

Western Ideas

(From time to time the Journal of Electricity plans to note new window ideas, good store features, selling schemes—in fact anything which is 'done better' by some one in the West. Is your store not represented in these columns because you haven't any ideas—or because you have failed to report them?—The Editor.)

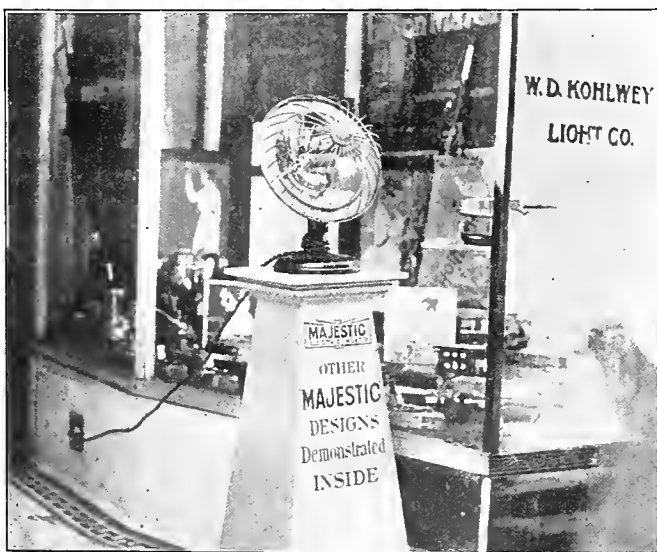
AT THE CALIFORNIA STATE FAIR the exhibit of C. Hobrecht of Sacramento successfully combined the advertising of lamps and washing machines and by its originality attracted attention to his further display of electric wares. He offered a handsome portable lamp for raffle, 5,000 tickets being given



A washing machine used as a ticket chopper

out in all. The lamp as displayed attractively in his show window attracted considerable attention in the first place and on the day of the drawing, crowds gathered about the place long before the scheduled time. In place of the usual raffle wheel, an electric washing machine was used to thoroughly mix the tickets, current being turned on for about five minutes. The spectators in the meanwhile interestingly noted the operation of the washer. A disinterested person then drew the ticket indicating the winner.

"ELECTRIC HEATERS SOLD HERE" is the impression which is driven home to every pedestrian who passes this shop. It is interesting to stand on the corner and watch them hurrying by. They bustle unconcernedly past florist windows, milliners' shops and bakers—but when they come to the electrical store, every one of them stops and looks—or at least

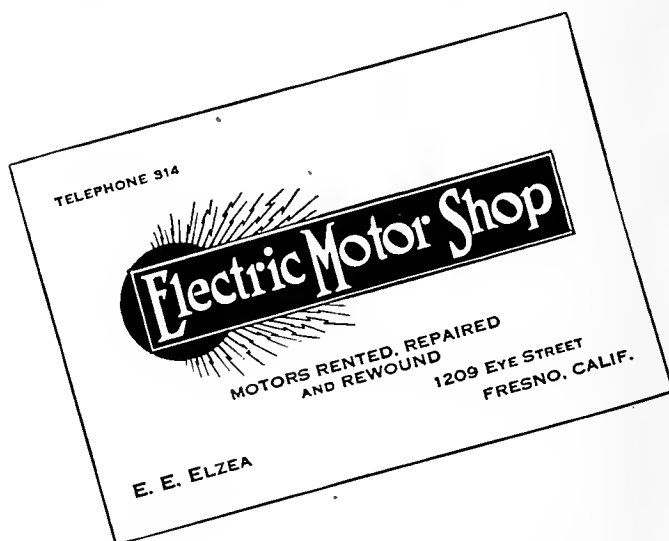


An advertisement you feel before you see

hesitates and turns his head. The idea is not an uncommon one but it is extremely effective. It consists of placing an electric heater in the front vestibule

of the store with the current turned on and so focussed that it strikes the passerby with a breath of heat directly across his face. The surprise of this localized warmth causes him to look up and impresses him with how inconspicuous and yet effective an electric heater can be. There is some trick of properly focussing the heat which makes certain exhibits of this kind more effective than others—it must strike the passerby full in the face to really have its effect. The practice of leaving the heater on even after the store is shut up and deserted for the night is also very telling—the surprise of the wave of heat coming from a quiet shop, obviously undirected by human hands, is even greater, perhaps, than in the daytime.

THE TRADE MARK has long been acknowledged as a useful thing for a manufacturer's product or a publisher's sign—but E. E. Elzea of Fresno, California is finding it useful in his contractor-dealer's business as well. He has adopted the little red banner with the electric sparks as his mark and uses it for all occasions. It is printed on his business cards, it is



This trade mark is used on visiting cards, in the show windows and in advertising

run with his advertisements in the paper—it flashes across his show window. "The Electric Shop" on a red ribbon means always his shop—and the public becomes familiar with the fact of its existence.

Another excellent idea is utilized by this same contractor-dealer in his window displays. In one window a motor will be shown—in the other, all the accessories of that motor. Aside from the attractive arrangement and frequent changing of the window, the customer is not confused with a scattered impression, nor repelled by a litter of odds and ends. One window always plays up the other—the customer is given one idea and that pressed home.

THE VALUE OF A CONFERENCE in centralizing the efforts of their employees is being recognized by manufacturer and jobber alike. This recent gathering of Western Electric men from their San Francisco office to discuss pushing the farm lighting plants is typical of what can be done along that line—and should prove suggestive to the contractor-dealer of the possibilities open to him. Regular meetings of the store and construction staff to talk over policies,



A conference of Western Electric workers to discuss policies and methods—a practice which might well be adopted by contractor-dealers among their employees.

point out opportunities of increasing business and explain the uses of some of the material which is passed on from the central station and manufacturer, should prove of untold worth. If he is going to make the most of the field open to him, if he is going to carry out new ideas and progressive methods, the contractor-dealer must have his employees with him, working out his ideas because they understand them, thinking along the same lines and even suggesting improvements here and there. You have often regretted, perhaps, that you had to pass anything over into other hands—that you could not do it all yourself. The best way of making your employee as much a booster of your business as yourself is to talk it over with him and let him feel himself part of a team working together—is, in fact, to hold a regular conference of your business staff.

SOME RECENT NOVELTIES of electricity have been gathered together by the Pacific Power & Light Company's Bulletin. Obviously, some are more practicable than others, but there may be an item or two here worth passing on to your customers:

Ten screws a minute may be driven in soft or even hard wood with the electric hand screw-driver.

Internal organs of soldiers may be photographed as easily as the skeleton with a new X-ray invention.

Electro-magnets are now widely used in holding pieces of metal while they are machined and polished.

Powerful electric sirens installed in Paris, France, will be used to warn citizens of the approach of Zepelins.

"What will they invent next?" Well, a hustling Colorado surveyor has adapted Mazda lamps to his instruments to allow surveying at night.

Horseback riding at night has been made safer for both horse and rider by the invention of an electric headlight attached to Dobbin's bridle.

Miniature naval battles may be staged in an ordinary bath tub with a new electric towing apparatus for moving model battleships about in the water.

Locomotive engineers have discarded the smelly oil torch used for inspecting and oiling engines at night and now powerful electric flashlights are used.

Lives of linemen are protected against high tension live wires by an instrument no larger than a watch which indicates whether the wires are carrying current or not.

Electrically operated carriers are used in up-to-date newspaper offices to speed up the delivery of news from the copy desk to the composing room where it is put into type.

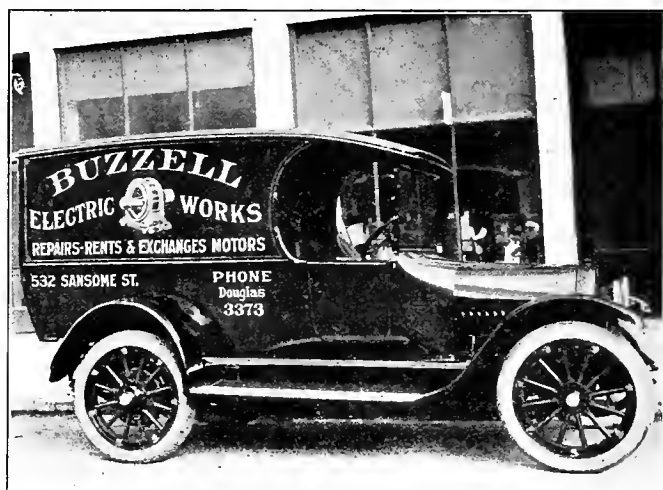
A new pocket lamp, which carries its own electric generating plant and requires no dry battery renewals, remains lighted as long as the dynamo is kept in motion by a lever operated by the thumb.

Static charges of electricity capable of igniting gasoline may be produced when gasoline is filtered through chamois or other insulating mediums in cold weather. The danger may be obviated by the use of metal gauze.

A safety feature which prevents the heat in an electric heating pad from rising to dangerous temperature is now used extensively; it consists in a fusible link is now used at a low temperature, thus automatically cutting off the supply of electricity.

Trees are "topped" with a charge of dynamite placed high among the branches and fired by electricity.

THE DELIVERY WAGON has been used as an advertising medium by bakery shops and moving vans and dyers and cleaners—I suppose the only reason some of us know of the existence of certain storage



A bill board that travels all over the city

houses is because of seeing their names on their huge wagons—but the idea up to now seems to have passed by most contractor-dealers. The value of a striking picture and an attractive sign for delivery wagons has, however, been fully appreciated by the Buzzell Electric Works of San Francisco in getting up their new delivery cars. The machine itself is most dignified and elegant and the effect of the motor and name in gold against the black is very pleasing. The machines have already attracted much favorable comment and are destined to spread in their advertising value.

WIRING RULES FOR FRENCH SHIPS

(All up and down the Pacific Coast, ships are being built as fast as they can be turned out. The wiring of these vessels must come under one of five rulings, according as they are intended for coastwise trade, United States wooden ships, for France or for England. In the issue of December 1, 1917, the Journal of Electricity published the rules which govern the wiring of the wooden ships now being built for the government. The following rules govern all wiring done on wooden and steel ships built for the French government.—The Editor.)

Bureau Veritas Rules on Electric Lighting

1. Dynamos to be of an approved type; continuous currents are to be preferred. The engine should be fitted with a governor, and situated in the engine room or in a separate adjacent compartment and efficiently ventilated.

2. The fittings on main switch board should be mounted on slate or other incombustible material, placed near the dynamos, and be accessible from the back if possible, unless all connections be established on the front of the switch board. From this main circuits should be led to auxiliary switch boards for distributing the current to the various branches, which may not be taken directly off a main cable.

A voltmeter for each installation, and an ampere-meter for each dynamo, to be supplied.

3. Leads to of copper wire having a conductivity of at least 98%. Single wires should not be less than 20 S.W.G. with a total sectional area of at least 1 square inch per 1250 amperes. The insulation on the leads should be absolutely watertight, and be capable of bearing a temperature of 150° F. without being softened. All cables should have an insulation resistance of not less than 700 megohms per statute mile after 24 hours immersion in sea water at a temperature of 60° F.

If alternating currents are used the insulation must be double that required for a continuous current of the same voltage.

It is recommended to test the insulation of the electric plant before proceeding on a long voyage.

Leads should be accessible. In cabins they should be laid in battens with covers screwed on; where exposed to moisture they should be lead covered, and be armored or protected by galvanized iron casings in cargo holds or wherever liable to be injured.

Watertight packings of an approved type must be fitted where leads pass through decks or watertight bulkheads, and the leads should be carefully protected from chafing against holes in beams, etc. All bends should be as easy as possible.

4. Joints must be carefully made and insulated to the same degree as the cables and should be in places always accessible.

Resin should be employed as a flux for soldering.

In the double wire system joints in flow and return wires should not be opposite one another.

In single wire plants the joints with hull must be accessible. Large cables should be secured in a copper plate bolted to the steel-work of the hull which should be scraped bright at the contact, the area of the contact being at least five times the sectional area of cables. A brass screw with non-oxidizable washer may be employed for single lamps and small cables.

5. Switches should be made so as to act quickly and be either full "on" or "off" without remaining in an intermediate position.

They should have large rubbing surfaces and be so arranged that the friction takes off the oxide formed. A switch should be fitted to each main and branch circuit, and the more important ones arranged so as not to be tampered with by irresponsible persons. In places affected by moisture they should be fitted in watertight boxes having portable covers.

6. Fusible cut-outs should be fitted as a rule at the origin of each branch circuit, and be situated close to switch, those for the larger cables being placed on the switch board. In double wire plants a cut-out should be fitted at the origin of each wire of each circuit. Like switches they should be placed in accessible positions and arranged so as not to be tampered with; be mounted on an incombustible base, and be fitted with a strong incombustible cover which should be watertight where exposed to moisture. They must melt with a current double the normal one, i. e. at 2,500 amperes per sq. in. and care must be taken to avoid mistakes in the size of fuses.

7. Lamps to be of an approved pattern, strong, well insulated, and efficiently secured in their sockets.

Those in machinery space must be watertight, and be protected by a glass globe with wire netting.

In crew spaces, passages, holds, etc., they must be of a strong pattern, efficiently protected by wire guards. Deck lamps as well as side and masthead lamps must be perfectly watertight and be fitted with detachable connections.

Electric Lighting in Oil Vessels

1. In oil vessels alternating current dynamos are strictly prohibited, and single wire plants should not be fitted.

The insulating material must be such as not to be injured by oil or vapors.

The leads must not be run through the tanks, and no switches, cut-outs or joints may be placed in the pump room.

All parts of circuits or fittings where sparks might be produced must be above the tank deck and situated where no gas can accumulate.

Arc lamps may not be used, and all incandescent deck and hold lamps are to be strongly protected by airtight globes with wire netting.

General Arrangement

1. The following precautions are recommended in order to lessen the deflections produced by electric currents: compasses, especially the standard compass, should be at least 33 feet from any continuous current dynamo or electric motor, and 50 feet from alternating current machines. No single wire to be nearer a compass than 16 feet; and if this be not possible the double wire or concentric system should be adopted in the vicinity of the compass. Chronometers also should be kept at a fair distance from dynamos and leads.

The influence of electric currents on compasses must be tested when these are being adjusted, with the vessel's head in any position and with all possible arrangements of currents in the leads likely to affect the compass.

STANDARD CODE OF PRACTICE FOR ELECTRICAL CONTRACTORS

(The following Code of Practice is recommended to architects, consulting engineers, contractors and owners and owners' engineers by The Electrical Contractors' Association of New York as a step toward the standardization of many practices in connection with original contracts and charges for extras which, unless definitely settled in advance, give rise to misunderstandings on both sides and frequently to controversies and litigation. The proposition was presented by F. W. Lord before the recent Contractors' Rally Meeting in New York.—The Editor.)

I. Contractors will submit bids for electrical work upon condition that a full set of plans, specifications and general conditions be placed at their disposal for a reasonable time, free of cost, for use in their office for the purpose of preparing an estimate.

II. The standard form of contract of the American Institute of Architects is to be the basis used for all bids, unless otherwise mutually agreed upon.

III. The contractor shall be paid monthly in cash at least 85% of the value of the materials delivered and the labor performed.

IV. Each contract shall provide for the prompt payment, and require final inspection and payment in full within thirty days of the completion of the work covered by said contract, regardless of the final settlement for the building as a whole or for the work of any other trade.

V. Differences arising between the contractor and other parties on a contract are to be subject to, and settled by arbitration.

VI. The contractor shall not be responsible for loss due to any delay in the execution of the contract when such delay is in no way the fault of said contractor. The time lost by reason of strikes, lockouts, fire, washouts, delays by transportation companies, or any other cause, over which the contractor has no control, will be added to the time of completion of the work covered by the contract.

VII. The contractor does not estimate on or include any charges for surety bonds, insurance not required by law, or any general charges for cleaning, removal of rubbish, patching or repairing of plaster, brick or terra cotta work, breaking of glass, office or telephone service, water, light, heat, fire insurance, use of general gangway, scaffolding, use of hoisting facilities, stenographer, watchman, erection of temporary structures, enclosures or stairs, or any other similar charge, unless mutually agreed upon in advance.

VIII. The contractor shall not be required to cut any work, except his own, and shall not be required to cut, alter or move his own work if due to any cause for which he is not responsible.

IX. Unless specifically provided for in the contract, an extra charge will be made for any special finish or variation from the standard materials. By "standard materials" is meant standard material as regularly listed by the manufacturer whose product is specified.

X. Changes in or additions to contract plans or specifications shall be made the subject of estimate or shall be based on the time and materials involved.

XI. If the regular and normal progress of the work is held up due to extras or changes or other

causes over which the contractor has no control, an interference or interruption charge shall be made, depending on the extent of the interference or interruption.

XII. A fair price will be charged for drafting or engineering services when the contractor is called upon to render such services.

XIII. The contractor shall not include temporary work in his estimate unless the quantities are distinctly stated. In no case should be included in an estimate maintenance or cost of current except on a percentage basis.

XIV.—"Cost" shall be understood to mean cost of material and labor and the administrative or overhead expense of the contractor.

THE WIRING OF INFLAMMABLE CHRISTMAS DISPLAYS

F. P. McGough, Chairman of the Show Window and Display Lighting Committee of the Western Assn. of Electrical Inspection, points out the dangers of the temporary wiring of Christmas window displays in a recent article in the Signs of the Times. His remarks are addressed to the manager or window decorator of the store in question, but the caution is one which should be particularly noted by the electrical contractor who undertakes such work. As well as observing especial care as to his own part of the job, he should point out the hazards which should be avoided by the store itself in the use of combustible material or dangerous draping. Experience proves that fires arising from an improper arrangement of electric wiring and lights in connection with inflammable Christmas decorations and displays invariably result from a want of circumspection on the part of those who are not conversant with the electrical fire hazard or the necessary safeguards for its prevention.

All temporary extensions to the electric service to provide additional lighting for such displays should be installed only by competent electricians, and the electrical inspection authorities should be duly notified of such changes so that a proper inspection can be made before the current is applied.

In the installation of the electrical portions of the display, care should be exercised to see that the wires and apparatus are kept well out of reach and securely placed. Advertising novelties and signs of flimsy construction, knife switches, cutouts, motors, flashers and all electrical devices having exposed contacts should be excluded from show windows and kept at a safe distance from combustible material.

Display managers should caution their assistants as to the necessity of keeping inflammable draperies as well as tinsel decorations from the immediate vicinity of fixtures, drop cords, lamps, sockets and receptacles, and should explain to them the danger attending the looping of wires from fixture to fixture to be used as supports for merchandise. In view of the widely circulated information on the dangers that result from the placing of inflammable material in direct contact with electric lamps and the use of combustible lamp shades, the continuation of such practices is inexcusable. The use of cotton batting, tissue paper decorations and similar highly inflammable materials for shop decorations should be abandoned.

Technical Hints

BY GEORGE A. SCHNEIDER

(The form and care with which a contract is drawn often swing the balance in the customer's mind and determine the awarding of the job. Add to this the legal complications which arise from verbal agreements and loosely drawn written transactions and it becomes apparent that the drawing up of the proposal is fully as important as any other part of the contractor's work. A suggested form is offered here for actual use or to serve as a model for a form of your own.—The Editor.)

NOTES ON CONTRACT FORMS

There is an old and well known axiom which states that a little knowledge of law is dangerous. No doubt this has been proven time after time. Still a knowledge of the fundamental principles of commercial law and especially of contract law is very convenient to the man in business. This does not, of course, mean that a business man should attempt to decide legal matters, without the counsel of a competent lawyer, but it can safely be said that a little knowledge along these lines will often help to decide when the services of a lawyer are advisable.

Investigation into the affairs of the average small electrical dealer and contractor will show that most of them do not use any form of written agreement or contract in the pursuit of their business. Most of their transactions are simply verbal agreements or written orders from their customers instructing them to proceed with certain work at a certain price. In either case there are always many chances for a misunderstanding and as a result the contractor may have a difficult time in securing an acceptance of the job and full payment for it.

Written agreements properly signed by both parties involved in the transaction not only tend to eliminate chances for misunderstanding and give reasonable assurance that the payments can be legally collected if necessary after the job is accepted, but they have other advantages as well. For instance, a well written proposal form is a good advertisement for the contractor. It indicates to a large degree the manner in which the contractor conducts his business. Assuming all other things to be equal, there are few persons who would fail to consider more seriously giving the contract to the contractor submitting his proposition in the most businesslike manner. This is not a theoretical argument. It is a fact and very frequently demonstrated in everyday practice. The writer has definite knowledge of a contract involving some \$5,000 which was let to a concern practically unknown in the particular field of work simply because of the careful manner in which their proposal was made up. Two of the bidders were old experienced firms and the three bids submitted were practically the same as regards price and the time to complete the job.

Again, a well compiled proposal often serves as a convenient means of checking up various competitors and their interpretations or understanding of the work to be done or apparatus to be furnished. One of the most important clauses in such an agreement or contract is the description of the apparatus, material or work involved. Invariably the various proposals are checked with the one which covers this point most completely, so that if one bidder has not provided for

certain apparatus, material or work, it is quickly brought to his attention and all other things being equal militates against his chances of securing the contract. This condition of affairs obtains especially in connection with jobs for which no specifications have been prepared, that is, where the contractor is called in and given a rough idea of the work to be done and then asked to submit a bid conforming with his own ideas as to how the job should be completed.

Then again there are advantages in favor of written contracts in case of death to one of the contracting parties, in case the business is to be transferred or the contract sublet and many other similar advantages which are generally known and need not be further outlined here.

Realizing that a more general use of a suitable proposal and contract form would tend to place the electrical contracting business upon a safer and more staple basis, one of the large jobbing concerns about one year ago printed a general proposal form for free distribution to its customers or others in the electrical industry who requested them. It is a proposal drawn especially to meet the needs of the electrical contractor, and when properly signed by the parties involved constitutes a contract between those parties.

This proposal is outlined completely in the following paragraphs for several reasons. First, in order that it may be copied in emergency when a suitable form is not available; second, as a guide to those who may wish to have their own forms printed, or otherwise made up; third, to serve as a reminder of the various points to be considered before submitting bids upon any job.

When using this proposal form or its equivalent special attention should be given to the paragraph providing for a general description of the apparatus, material or work involved; the terms of payment; the expiration of the proposition and the acceptance of the proposal. As is noted in the second paragraph, this form provides for as many pages of specifications as are required to properly describe the work to be done or material or apparatus to be furnished. If the proposal is based upon definite specifications which have been submitted before hand to the contractor then generally no additional pages of specifications are necessary. It will be sufficient to make reference to these specifications under the space provided in paragraph four. Otherwise only brief description should be given in this paragraph and a detailed description included on special sheets attached to the proposal. In either case, the description should be so complete that there will be no chances for misunderstanding, either by the parties involved or by anyone who may have occasion to handle the transaction in case of emergency or transfer or for any other reason.

The terms of payment should be carefully stated as this is a point upon which there is often much chance for discussion. Also the contractor must not overlook filling in the expiration date of the proposal as otherwise it would be extended indefinitely.

Except when the transaction is with an individual special care should be taken to determine whether the person signing the contract is authorized to do so and if this signature makes the contract a legal docu-

ment. For example, in corporations only certain officers can execute such documents, then again the business may be run on the partnership basis, or the contract may involve an estate, in which case the signatures of certain trustees or executors are necessary before the contract can qualify as a legal document.

So it is in dealing with cities and villages. The authority of public agents is fixed by law. If a public agent of a city or village signs a contract which he is not authorized to sign, it is void. In taking a contract from a small city or village the contractor should get the number of the ordinance authorizing the expenditure and find out from a local bank or an attorney if the ordinance was legally passed, and if the legal indebtedness of the city has been exceeded. If the contract is to be paid for in warrants the contractor should find out from the City Clerk and bank, against what fund the warrants are to be issued and if there will be money in the fund when the payments become due. If the warrants are legally provided for and there will be no money in the fund to cash them, when they are issued, arrangements can usually be made with a local bank to buy the warrants, either at par or at a discount. If necessary at a discount, a letter signed by an officer of the bank agreeing to purchase the warrants at a specified price should be obtained. This letter should make reference to the ordinance number which provides for the expenditure.

Contract Form—Proposal

....., hereinafter called the Contractor,
submits for consideration the follow proposal to.....

.....
hereinafter called the Purchaser. When this proposal is accepted and signed in duplicate by the Purchaser and by the Contractor, it shall constitute a contract between the parties hereto.

The Contractor agrees to furnish the apparatus or material or to perform the work described below for the Purchaser, all in accordance with the attached.....pages of the specifications, which are made a part hereof.

All previous communications, either verbal or written, with reference to the subject matter hereof are hereby withdrawn and annulled, and this proposal may be modified only by a supplementary agreement.

General Description of Apparatus, Material or Work:

Location:

The apparatus or material to be furnished or the work to be performed under this contract will be installed in the premises of.....

located at

Title to Property:

The title and right of possession to any apparatus or material furnished by the Contractor hereunder shall not pass to the Purchaser until all payments hereunder shall have been fully made in cash, whatever may be the mode of attachment of such apparatus or material to the realty or otherwise. Upon failure to make payments, or any of them, as herein specified, the Contractor may retain any and all partial payments which have been made, as liquidated damages, and shall be entitled to take immediate possession of said apparatus or material and be free to enter any premises where said apparatus or material may be located, and to remove the same without prejudice to any further claims on account of damage which the Contractor may suffer from any cause.

Guaranty:

The Contractor guarantees to correct any defects in the apparatus or material furnished or in the work performed hereunder, which may develop under normal and proper use, within thirty days from the delivery of said apparatus or material, or if work is to be performed, then within thirty days from completion of such work, provided the Purchaser gives the Contractor immediate written notice of such defects, and provided further, that during said period, said apparatus or material shall not be taxed beyond its normal capacity, and shall be regularly cared for and shall be operated normally and properly. The Contractor agrees that all work shall be done in a thorough and workmanlike manner, but he shall not be held responsible for the work done, material furnished, or repairs, or attachments made by others.

Completion:

The Contractor agrees to complete the delivery of apparatus or material or the performance of the work called for hereby within.....days after the date of acceptance of this proposal by the Purchaser, or within.....days after the building is in condition for the Contractor to proceed with the work without interruption. The Contractor shall not be held responsible for any loss, damage, detention or delay caused by fire, strikes, civil or military authority, or by insurrection or riot, or by any other cause beyond his control, nor in any event for consequential damages.

If, during the progress of the work called for in this contract, conditions arise through no default or failure on the part of the Contractor, which prevent the Contractor from proceeding with the completion of his work in the usual manner, the Purchaser agrees to pay the Contractor in full for all work done under this contract; the sum to be paid shall be the proportion the completed work bears to the entire contract and shall become due and payable thirty days after the date upon which the Contractor is compelled to cease work.

Inspection:

All work to be performed hereunder by the Contractor shall be in accordance with the Ordinances, if any, of the City of.....applying to such work, and any certificates required from the officials of said City shall be procured by the Contractor and delivered to the Purchaser. Any fees or other charges made by said City for certificates shall be borne by the.....

Price:

The Contractor agrees to furnish the above mentioned apparatus or material or to perform the work under the provisions herein contained for the sum of.....Dollars (.....) which amount the Purchaser, by his acceptance hereof, agrees to pay in the manner and at the time herein specified.

Terms:

The amount above specified is not subject to cash discount and is to be paid at the office of the Contractor, located at.....in the following manner:

.....
All payments above provided for shall bear interest at the rate of.....per cent per annum after they become due.

Insurance:

The Purchaser shall keep the apparatus or material furnished hereunder insured against fire, in responsible insurance companies, for not less than 80% of the contract price of said material, until fully paid for. Said insurance shall be carried in favor of both parties hereto for their mutual benefit as their respective interest may appear.

Expiration of Proposition:

This proposal is void unless accepted and returned on or before.....days from date of its submission.

Respectfully submitted,

.....
(Contractor)

Accepted this.....day of.....19.....

.....
(Purchaser)

WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(If several of your claims are not allowed by the patent examiner, it becomes the duty of your attorney to look into the justice of the decision and contest the findings if there appears to be grounds for such action. It is the general experience of inventors that claims first denied are later granted. The question of fees and time involved are here also taken up. The authors compose the firm of White and Post, prominent patent attorneys of San Francisco.—The Editor.)

NOTES ON THE LAW OF PATENTS

Prosecution of the Application

After the filing of an application in the Patent Office, it is taken up for consideration by the Examiner, and the applicant's attorney is advised of the conclusions of the Examiner in regard to the patentability of the claims. Very infrequently, the application is allowed on this first action, but ordinarily some of the claims are allowed and some are rejected.

To be patentable, the subject-matter of a claim must be novel, useful and the result of an inventive act as distinguished from the product of mere mechanical skill.

Whether the production of a particular novel thing required the exercise of the inventive faculties or required the exercise of only mechanical skill, raises a question often difficult of determination and concerning which courts, patent office tribunals, mechanical experts and patent attorneys frequently hold widely divergent views and opinions. There are many patents which have been adjudged valid by some courts and invalid by others, by reason of a difference of opinion on this question of invention.

In determining the question of the novelty of the subject-matter of a claim, the Examiner is entitled to refer to the whole prior art as disclosed in prior patents and prior printed publications. If the subject-matter of the claim is found disclosed in any such prior patent or publication, the claim is rejected, and, therefore, it frequently happens that the rejection of a claim is based upon some prior United States patent, or upon some prior British, French, German, Swiss, Swedish, Norwegian or other foreign patent or upon some prior text-book, catalogue or other printed publication which may have been published in this or any foreign country hundreds of years prior to the date of the application.

When an applicant learns that his invention is described in a book published hundreds of years before, he is very apt to approve of the following sentiment:

"Confound those thieving ancients who are always stealing our modern ideas."

Frequently a rejection is based upon the Examiner's contention that the invention is merely a combination of two or more disclosures respectively found in two or more prior patents or publications and that the combination, by the applicant, of such disclosures in one machine or device did not require invention but only mechanical skill.

On receipt of the Patent Office letter, containing the Examiner's action, the applicant's attorney is compelled to examine any prior patents or publications, cited by the Examiner as the basis for his action, and

determine whether or not the Examiner's action is justified and proper.

If the rejection is proper and the claims are clearly anticipated, the rejected claims must be cancelled or amended in accordance with the Examiner's suggestions made in connection with his rejection of the claims.

If the applicant's attorney is of the opinion that the Examiner's action is improper and not justified by the references cited by him, the attorney replies to the Patent Office action by sending a letter containing an argument pointing out the error of the Examiner's position. In response to such argument, the Examiner again acts on the case and the attorney is entitled to again reply to such action, and so on until the Examiner either finally allows or finally rejects all of the claims contained in the application as filed or thereafter inserted therein from time to time by way of amendment of the application. Some of the claims may be finally allowed and some finally rejected. From such a final rejection, an appeal may be taken through the various Patent Office tribunals and finally to the Court of Appeals for the District of Columbia.

In some cases of a complex nature, the actions of the Examiner and the attorney's replies thereto are very numerous and extend over a period of years. A copy of the application, as filed, together with a copy of all said actions and replies thereto, and of the patent, as finally issued, constitute what is termed the "File Wrapper Contents of the Patent."

The broadest claims of a patent are the ones that cover the very essence of the invention stripped of every non-essential feature. As a rule, the broadest claims in an application are the ones most frequently rejected and the most difficult to get allowed. Such a situation is attributable to various reasons which cannot be set forth in these brief, elementary notes.

The narrow claims of a patent are those that cover the specific embodiment of the invention in that particular form deemed by the inventor to be the best or preferable form and, therefore, a form containing valuable but not necessarily essential features. In other words, the so-called "preferable" form of embodiment is usually a machine containing valuable features, one or more of which can be dispensed with and the machine, nevertheless, successfully perform its functions even though less perfectly or economically.

It is most important for an inventor to appreciate the work done by his patent attorney after the filing of the application. As above indicated, the prosecution of the application to an allowance usually involves a great deal of hard, conscientious work and often embraces numerous and lengthy arguments based upon a detailed consideration of a great many prior patents

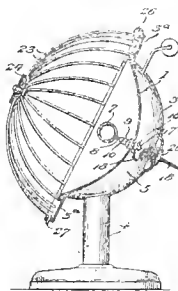
and publications cited by the Examiner as the basis for his actions. It is a conservative statement to say that it is the rule and not the exception for an Examiner to finally allow claims in an application which were first rejected by him, and such allowance is due to the persuasive and convincing arguments presented by the applicant's attorney.

It is most important for an inventor to appreciate the fact that "the line of least resistance" for his attorney to follow is to always acquiesce in the Examiner's contention and, without argument or contest, accept whatever the Examiner, in the first instance, is willing to allow. To follow such "line of least resistance" means a sacrifice of the inventor's rights and property, but it also means less work and trouble on the part of his attorney, and the inventor should be keenly alive to such situation. If an inventor expects to secure a patent granting him a monopoly as broad as his invention, he should expect to and be willing to compensate his attorney for vigorously prosecuting the application and conscientiously presenting every point and argument in favor of the allowance of every claim which, in the attorney's opinion, has been improperly rejected.

NEW IDEAS FROM THE WEST

Electric Heater

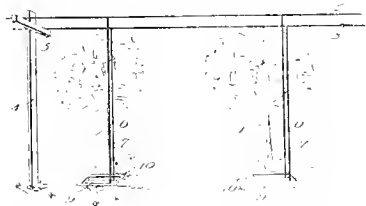
Patent No. 1,245,084 issued to Edmund N. Brown of San Francisco, and assigned to Majestic Electric Development Company, discloses an electric heater of the reflection type.



This heater comprises a concave reflector having a heating coil arranged at its focus. Surrounding the reflector and extending outwardly therefrom is an annular plate, to which the protecting cage is hinged so that access may be readily had to the heating coil.

Orchard Heating System

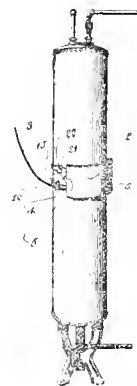
Patent No. 1,245,028 issued to George Q. Riley of Corona, California, discloses a novel system for protecting orchards and orange groves from damage by frosts. A plurality of



open top water tanks are disposed throughout the orchard with the tops of the tanks level with the surface of the ground so that they will receive and collect surface drainage. An electric heater is submerged in the water in each tank and the heaters are connected to overhead service wires, so that when the circuit is closed, the water is vaporized, producing a fog which protects the trees against frost damage.

Heater for Hot-Water Tanks

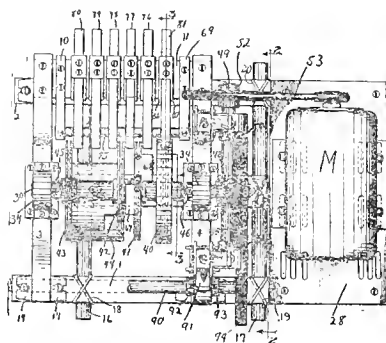
Patent No. 1,244,717 issued to Russell A. Willson of Spokane, Washington, shows an electric heater for hot-water tanks. This heater is adapted to be strapped on to the out-



side of the metallic water tank and consists of a hollow shell within which the heating element is arranged. The edges of the shell are held tightly against the side of the tank, so that an air-tight chamber is formed within the shell.

Sign Flasher

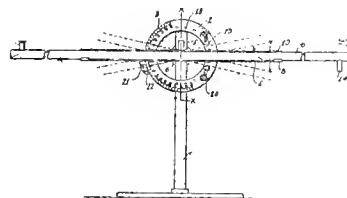
Patent No. 1,245,105 issued to Fred Hotchner of San Francisco, California, discloses a novel form of flasher for



electric signs. This flasher comprises a rotatable contact drum supported in frames which are connected by the brush-holding bar, brushes mounted on said bar and an insulating rod against which the brushes strike when they are not in contact with the drum.

Viscometer

Patent No. 1,244,025 issued to Charles Browning, Jr., of Sacramento, California, discloses a novel instrument for determining the viscosity of fluids. The instrument comprises a straight transparent tube which may be set at a predeter-



mined angle to the horizontal. Arranged in the tube so that it is free to roll therein is a sphere of greater specific gravity than the fluid to be tested. The fluid is fed into the lower end of the tube and is discharged from the upper end of the tube and the sphere rolls against the fluid current. The rate of travel of the sphere against the current determines the viscosity of the fluid.

SPARKS—Current Facts, Figures and Fancy

(By special arrangement with the banks of any large city the self-identifying check system may be adopted. This makes it possible to pay even day labor by check and does away with the dangers of robbery, as well as enabling the employer to keep a mechanical record of payments. Prospects for electric vehicles, a vacuum cleaner parade, a reclamation achievement of electric pumps and other items of interest are here discussed.—The Editor.)

Flood lighting is used to protect other things than water-works and industrial plants. Report comes from Stockton of a farmer who suffered from the depredations of thieves in his one-acre bean patch. He installed an electric lighting system and now enjoys the security of an ever constant electric police.

* * *

The authorized electrical equipment for U. S. battleships and battle cruisers totals more than one million horsepower. Each of the last seven battleships, equipment for which has already been ordered, required approximately 33,000 horsepower. Each of the five battle cruisers requires 180,000 horsepower to propel. Each battle cruiser carries four high-speed, turbine-driven generating units.

* * *

Electric light and power companies of California expended more for extensions and improvements than the steam railroads of the state during the four years ending with 1916, according to the California Railroad Commission in a report just issued. Construction of the electric companies during this period amounted to \$68,172,678, while that of the steam railroads was \$61,155,287. Gas companies invested \$16,853,869 additional.

* * *

One of the most interesting experiments ever made in the reclamation of the arid West is at present in progress in Quincy Valley, Wash., where well water is being pumped from maximum depths of 300 feet to irrigate apple orchards, and where at one of the largest plants, about 1,000 gallons a minute is recovered by means of a huge reciprocating pump from a single well in which the water stands about 230 feet below the surface.

* * *

A recent vacuum cleaner campaign in Denver was advertised by a procession of automobiles. In lieu of a band an electric piano mounted on a truck led the parade. Then came two trucks loaded with the machines, followed by cars decorated with suitable advertising banners. A horse and wagon brought up the rear and served to accentuate the comparison feature and make it applicable to sweepers. The campaign lasted two weeks, and the results were 510 machines sold, for a total value of \$29,896.

* * *

Bulletins from the Food Conservation Board often contain items of interest to electrical men. Report is there made of a power plant whose consumption of lubricating oil was abnormally large. The engineer was unable to explain the cause so a supervisor was sent to investigate. He drilled into the engine foundation and discovered a small crack in the bedplate

casing through which oil was escaping from the lubricating system, a loss that was stopped by closing the crack with electric welding.

* * *

It is probable that after the war there will be a favorable opportunity in England for the sale of electrically propelled vehicles. Many persons are convinced that the price of gasoline will remain high even after hostilities cease, and in fact may never again be as low as in prewar times. When the war is over it is thought that there will be a large demand for the electric car. Several municipalities have been experimenting with heavy electric vehicles and have obtained satisfactory results. They have been found to be especially suitable for such work as town scavenging.

* * *

What comes of analyzing the contents of the waste baskets in two large office buildings may be judged by the following. This is the result of one night's foraging: 1057 gem clips, 390 rubber bands, 68 pencils, 14 McGill paper fasteners, 1 pen holder, 4 pen points, 5 erasers, 4 sponges, 3 thumb tacks, 2 screw eyes, and 5 multiple plugs. In addition to the above there were about 62 yards of rope in various lengths, and some 26 yards of string; also a desk calendar base, half of a memo pad, and a quarter roll of adding-machine paper. The approximate yearly waste in these two buildings is \$1350.

* * *

The American soldier is wearing seven league boots these days. Some idea of how quickly the continent is being spanned by the khaki contingent can be obtained from a statement by local officials of the Railroads' War Board, that 8,000 soldiers have just been moved from the Pacific to the Atlantic, 3,700 miles, in just six and one-half days. The men carried all their equipment with them and were provided with sleeping cars by the Pullman company. The trains operated in sixteen sections and consisted of twelve tourist cars and two baggage cars. There were five hundred men to a train.

* * *

Men engaged on construction work are seldom paid by check, because of the objections raised on account of the difficulty of cashing checks. This difficulty can be overcome by the use of a self-identifying feature similar to that of travelers' checks issued by express companies. On the face of the check a space is provided for the signature of the employe, and this signature is written in the presence of the paymaster. Then if the employe endorses the same check on the back in the presence of a bank cashier, or other person who cashes the check, the agreement of the two signatures is sufficient evidence that the right person is cashing the check.

PERSONALS

Lieutenant Edward B. Strong, Jr., of Co. F, 159th Infantry, and W. A. Strong, electrician in the U. S. Naval Radio Service, constitute the contribution of service to the nation



from the editorial and managerial staff of the Journal of Electricity. Lieutenant Strong is Treasurer of the Technical Publishing Co., publishers of the Journal of Electricity, and has actively been engaged in its behalf for several years prior to his present service with the government at the National Army Camp at Linda Vista. W. A. Strong, his younger brother, is now somewhere in the Pacific in charge of radio service for the government. These young men, sons of E. B. Strong, president of the Technical Publishing Company, are typical of the spirit of the Great West in their enthusiasm and patriotic fervor for service in the cause of democracy. It is as a consequence, with no little pride, that a service flag with two embroidered stars now hangs in the offices of the company.

C. H. Thordarson, president of the Thordarson Electric Manufacturing Company of Chicago, is a recent San Francisco visitor.

H. J. Gille, sales manager Puget Sound Traction Light & Power Company, Seattle, is making a business trip which will cover a number of eastern cities.

Ralph S. Twogood, formerly in the electrical department of the Southern Pacific Company at San Francisco, has joined the colors as a captain in one of the engineering regiments.

A. J. Twogood, formerly with the distribution department of the Pacific Gas & Electric Co., is now in the electrical department of the Southern Pacific Company with headquarters at Portland.

G. G. Anderson, consulting engineer of Los Angeles, has resigned as advisory engineer of the Imperial Irrigation District, in which work he has been associated with C. E. Grunsky of San Francisco.

M. C. Rypinski, head of the meter and transformer section of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, is visiting San Francisco and other Pacific Coast cities.

H. H. Hoxie, salesmanager of the Electric Railway Manufacturers & Supply Co., has resigned to become associated with the North Coast Electric Supply at Seattle of which Harry Byrne is manager.

C. Whitestone, for some time connected with the Port of Seattle commission on electrical and mechanical work, has been appointed electrical and mechanical engineer by Chief Engineer George F. Nicholson.

Percy E. Wright, consulting mechanical engineer of Seattle, Wash., has taken the management of the Jeffery Manufacturing Company of Columbus, Ohio, for the Northwest and opened offices in the L. C. Smith Building, Seattle.

C. E. Grunsky, consulting engineer of San Francisco, has recently been called to Washington, D. C., for a conference with the Secretary of the Interior in regard to the affairs of the Imperial Irrigation District for which he is consulting engineer.

R. M. Alvord, manager of the supply department of the General Electric Company at San Francisco, has been appointed chairman of the commercial section of the Pacific Coast Section N. E. L. A. to succeed Stanley V. Walton, resigned.

Chas. C. Moore, president and Elgin Stoddard, general manager, of Chas. C. Moore & Co., engineers, have returned from the national capital, where important governmental contracts have been let to their firm as announced on another page of this issue.

Walter C. Wagner, an electrical engineer with the U. S. Bureau of Standards, who has been spending some time in the Northwest investigating standardization problems of interest to hydroelectric companies and men of the electrical industry is now in San Francisco.

Charles H. Rattray, construction engineer for the General Electric Company, recently returned to Seattle from China and Japan, where he installed machinery and inspected shipbuilding plants in the latter country. On his way back he visited Honolulu and viewed the volcano Kilauea near that city.

R. H. Ballad, vice-president and assistant general manager of the Southern California Edison Company; K. E. Van Kuran, Los Angeles manager of the Westinghouse Electric & Manufacturing Company; and A. Emory Wishon, assistant general manager of the San Joaquin Light & Power Corporation, are recent San Francisco visitors.

W. A. Jordan, sales manager of the American Vulcanized Fibre Co. of Bloomington, Del., and F. F. Skeel of Chicago, western sales manager of Crouse Hinds Co., are recent Pacific Coast visitors. Both these men are enthusiastic over the



business prospects of the West and men of the industry found genuine pleasure in talking with them during their recent brief sojourn on the Pacific Coast. The Journal of Electricity as a consequence feels unusual pride in having found these men at a moment of leisure in which to get the photograph shown herewith.

H. H. Barter, engineer and technical director of the Triangle Film Corporation plant at Culver City, Cal., has accepted a call to one of the most responsible executive positions in the American International Shipbuilding Corporation of Philadelphia, which is the active agent for the United States Shipping Board Emergency Fleet Corporation.

Fred L. Wright, founder of the California Light and Telephone Company, has retired from its presidency and management to devote his attention to his two big ranches in Sonoma

county. **Leo. H. Susman** of San Francisco has been elected president of the company by the directors; **Frank P. Doyle**, president of the Exchange Bank of Santa Rosa, vice-president; **W. P. Ferguson**, general manager.

A. G. McGregor, a mechanical engineer of Warren, Arizona, who has during the past two years had charge of the installation of the great smelting plants at Ajo and Inspiration, has recently purchased a prominent business block at Warren, in order to acquire greater facilities for his staff of specialists who have designed all of the more recent smelting and leaching plants of the Southwest.

Fred G. Whaley, who has been city engineer for the city of Chehalis and water superintendent the past four years, has resigned his position. Mr. Whaley has taken a position with the state of Washington as valuation engineer, working in co-operation with the state examiner's department on water and light public utilities. He will first be located at Tacoma, but his work will cover the whole state.

Emerson Hoar, electrical engineer for the California Railroad Commission, has been called for service in the next officers' training camp for engineers. Due to the extremely valuable service Mr. Hoar is now rendering the state in studying the interconnection of power lines and the maintenance of continuity of the state's industrial activity an effort is being made to have him exempted from service.

Professor John Fay Wilson has accepted the position of Associate Professor of Electrical Engineering at the University of Southern California in Los Angeles. Professor Wilson occupied for five years a similar position at the University of Michigan, and during the past year at Queens University, Kingston, Canada. He is the author of "Essentials of Electrical Engineering" and "Dynamo Laboratory Outlines."

R. E. Fisher, of the commercial department of the Pacific Gas & Electric Company, is receiving congratulations on all sides for the excellent manner in which the annual show of the Pacific Service Employers' Association was recently staged in the Scottish Rite Auditorium in San Francisco. **Harry Bostwick**, assistant to the first vice-president of the company, is president of the association and under his able leadership the organization has grown to be a real force for good in the utility life of the state.

James H. Ellis, research associate in physical chemistry at Throop College of Technology, Pasadena, Cal., has become a member of the physics department of the college as instructor in electrical measurements. Mr. Ellis was graduated from the Massachusetts Institute of Technology in 1912 with the degree of bachelor of science and in 1916 with the degree of doctor of philosophy. He was assistant in the electrical laboratory of the Massachusetts Institute of Technology in 1913-14 and research associate in physical chemistry at the same institution from 1914 to 1916.

W. F. Durand, professor of mechanical engineering at Leland Stanford Junior University, now on leave of absence at Washington, D. C., is chairman of the National Advisory Committee of Aeronautics and chairman of the Aeronautics Committee of the National Research Council. Professor Durand has been engaged on the aircraft problem for some months in Washington and is more familiar perhaps than any other man with the steps this country has taken in the remarkable feat of standardization of aircraft production. He recently delivered a talk before the annual convention of the American Society of Mechanical Engineers at New York City on the subject matter he has under investigation.

Stanley V. Walton, formerly head of the commercial department of the Pacific Gas & Electric Company, is now an energetic "agricola" at Yuba City, California. From latest reports it is said that 3 in 1 oil still keeps the shine on his golf sticks, which were for so long a period a contributor to well earned good times among men of the electrical industry. Mr. Walton states that if any of the old gang wander up his way his phone number is 52F2, the F being short for Farmer. He adds that the geese and ducks are plentiful and that he is

open to any new ideas on daylight saving devices, although as a rule he goes to bed at ten with the happy thought that he has nothing to do till two in the morning.

OBITUARY

Thomas A. Cashin, superintendent of San Francisco's Municipal Railway System, died on Dec. 5th at his home in Piedmont, after an illness of several months. Heart trouble was responsible. Mr. Cashin was appointed as superintendent October 1, 1912, before the city lines were constructed, and served the city from the actual beginning of the building of the lines. He was unmarried.

TELEPHONE COMPANY MAY CHANGE NUMBERS

The Mountain States Telephone and Telegraph Company has the right to change the numbers and the prefixes assigned to its patrons in the telephone directory as may seem to it necessary and best in accordance with rendering efficient service to the public as a whole. Such is the gist of a decision rendered by the Public Utilities Commission of Utah.

NEED FOR MORE HYDROELECTRIC POWER

Unless the Government throws open to development water power sites on Federal lands, gas and electric companies within two years will be unable to develop sufficient power to meet an ever-increasing demand. John A. Britton of the Pacific Gas & Electric Company testified recently before Railroad Commissioner Frank R. Devlin at the opening of the California Railroad Commission's investigation of war-time conditions in corporations that supply the public with gas and electricity.

"The high price of fuel oil makes necessary the development of more hydroelectric power," Mr. Britton said, "but the use of power sites is deterred by the regulations of the Department of the Interior. The Federal Government can give relief by opening power sites on Government lands. If restrictions were removed 500,000 horsepower could be developed in California, and 150,000 horsepower could be developed in two years.

"At the present rate of growth the water power now controlled by the various companies will be exhausted in two years, and that in spite of the fact that the utilities can co-operate by interconnecting and using all power to the limit."

Mr. Britton suggested a plan whereby consumers would share in the cost of extensions. He said the high price of materials and the scarcity of labor made connections difficult. Mr. Britton pleaded for exemption from draft of skilled laborers in plants and systems.

H. F. Jackson of the Sierra and San Francisco Power Company, president of the Pacific Coast Section of the National Electric Light Association, also pleaded for a loosening of Government restrictions on water power sites.

"The companies should divide their territory to avoid duplications of service," he said. "Steam plants might be operated more economically if one were made to serve several companies operating in the same region."

"Banking rules should be modified to permit Federal reserve banks to discount the notes of public utilities," **R. H. Ballard**, vice-president and assistant general manager of the Southern California Edison Company, suggested. "The financial crisis due to the war has made very serious the problem of financing the natural growth of the companies."

"Virtually all the companies near Los Angeles have interconnected their systems to make use of all available power. The problem now is to avoid duplication of distribution facilities."

Guy C. Earl, representing the Great Western Power Company, said "Government aid in financing is necessary to utilities to carry out extension requirements."

The Railroad Commission will investigate all phases of the war situation in the gas and electric business and report its findings from time to time.

MEETING NOTICES FOR ELECTRICAL MEN

(A recent meeting of the executive committee of the Pacific Coast Section of the N. E. L. A. developed plans for a merchandising movement of considerable importance. The spring convention to be jointly held with the contractor-dealers and jobbers was tentatively scheduled for the third week of April at Del Monte. Important meetings of the San Francisco Development League and reports of activity from both Portland and Los Angeles further mark this two weeks period.—The Editor.)

Pacific Coast Section N. E. L. A.

A special meeting of the Executive Committee of the Pacific Coast Section, National Electric Light Association, was held December 5th, at San Francisco, with President H. F. Jackson, Secretary A. H. Halloran, R. H. Ballard, Henry Bostwick, W. W. Briggs, D. E. Harris, H. C. Reid, K. E. Van Kuran and A. E. Wishon in attendance. Del Monte, California, was selected as the meeting place for the annual convention during the third week of April, 1918. This will probably be a joint convention with the contractor-dealers and jobbers.

Robert Sibley, editor of the Journal of Electricity, was appointed chairman of the convention committee. R. M. Alvord of the General Electric Company was appointed chairman of the commercial committee to succeed S. V. Walton, resigned.

Definite steps were taken toward the creation of a closer understanding and affiliation between all branches of the industry with one all-inclusive association as the ultimate object in view.

The executive committee enthusiastically approved the co-operative selling and educational plan submitted by the commercial committee after definite assurance had been given that each branch of the industry would contribute its quota. Comment on this splendid new movement in merchandising may be found on the editorial page of this issue. In detail this plan has been worked out as follows:

First: That the central stations, manufacturers, jobbers, contractors and dealers subscribe to a fund aggregating \$12,000.

Second: That the campaign be conducted under the auspices of the California State Contractors' and Dealers' Association.

Third: That it will be the object of the campaign to promote co-operative sales advertising and educational work among those engaged in merchandising of electrical material, assisting the dealers in the proper fitting up of their stores, and providing attractive window displays, etc.

Fourth: That a committee be appointed representing each branch of the industry who will serve as an Advisory Board in formulating ways and means for the handling of the proposed work.

Fifth: The central stations throughout the territory will devote a certain amount of their regular advertising space each week in the conduct of the campaign, and all such advertising will be carried on simultaneously throughout all districts of California.

Utah Society of Electrical Contractors and Dealers

The Utah Society of Electrical Contractors and Dealers,

though perhaps the youngest organization of its kind in the West is nevertheless proving itself to be an enthusiastic group of men.

Dec. 18, 1917 is the date set for a program of ambitious proportions. Edgar C. Raine has been engaged to give at Barratt Hall, in Salt Lake City, a travelogue in natural colors on Alaska—the Frontier Wonderland of the World. A campaign for the sale of fifteen hundred tickets at fifty cents each is now under way. Much credit is due G. J. Guiver for his energetic work in promoting the idea.

Joint Meeting of the Portland Sections of the A. I. E. E. and N. E. L. A.

The November meeting of the A. I. E. E. and N. E. L. A. was held at the Multnomah Hotel on Tuesday evening, Nov. 20, 1917. The chairman of the evening was E. D. Searing of the Portland Railway, Light & Power Company.

The speaker of the evening was Mr. Preston S. Millar of the Electrical Testing Laboratories of New York City, who spoke on the subject of "Illumination as Applied to Street Lighting," which he illustrated by means of lantern slides.

Mr. Millar first reviewed briefly the history of street lighting, pointing out the common error of the specifications which had been incorporated into street lighting contracts between public utilities and municipalities. He further reviewed the work being done by the Street Lighting Committee of the N. E. L. A. In conclusion, he said that a great deal had been accomplished by this committee, but no final concrete

basis had been established by which a specification could be written in order to correctly measure street illumination so that both the public and the utility would receive a "square deal." He warned against utilities "tying themselves up" at the present time on the basis of any of the present-day specifications as there was no one prepared to say whether they could be complied with or not. He is hopeful that in time a thorough method of testing street illumination will be devised, but this service is likely to be expensive as the problem is very intricate.

After the meeting refreshments were served.

San Francisco Electrical Development and Jovian League

Old Timers' Day is one that will long be remembered by those who attended the San Francisco Electrical Development League on Nov. 28, 1917, the day before Thanksgiving Day. From the beautiful but simple little ceremony wherein little tots five years old brought in bouquets of flowers numbering thirty to forty-three carnations each, depending upon the years of service rendered to the industry by the recipient, to the six "Old Timers," the guests of the day, the ceremony

BUILDERS OF THE WEST—XIX



W. F. DURAND

The helpful activities of the great universities of the West have in the present national crisis called forth unstinted praise on all sides. To W. F. Durand, professor of mechanical engineering at Leland Stanford Junior University, long beloved by the host of engineering students that have gone forth from its halls, this issue of the Journal of Electricity is affectionately dedicated in appreciation of the masterful service he is rendering with the Aviation Board at the national capital, as chairman of the National Advisory Committee of Aeronautics and chairman of the Aeronautics Committee of the National Research Council.

proved interesting and inspiring. Those so signally honored were John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company; Dr. Thomas Addison, western manager of the General Electric Company; Edward B. Strong, president of the Technical Publishing Co., publishers of the Journal of Electricity; Squire V. Mooney, president of John Roebling's Sons Co.; Colonel H. V. Carter, formerly president of the Pacific States Electric Co.; and Frank Smith, general manager of the Frank E. Smith Testing Laboratories.

The sentiment of the day so beautifully brought out by Mr. Britton in his remarks at the conclusion of the ceremony, was also well-echoed in the two little poems, the one calling the meeting of Old Timers through the "Live Wire" and the other lauding the Old Timers at the meeting, as follows:

OLD TIMERS' DAY

BY A. H. HALLORAN

Away out here by the Western sea
There came brave men of old,
To blaze the trail for electricity
In this fair land of gold.

They dared the deserts and tamed the rivers,
They pierced the mountains high,
Let us to them of thanks be givers,
Even both you and I.

Their footsteps were the first surveys
To show the way to go,
We travel now the great highways
That from their toil did grow.

Resistlessly and tirelessly
They played the game of life,
They paved the way for you and me
And cleared away the strife.

To those of them who still are here
Let us all honor pay,
And tribute give to the Pioneer
On this his special day.

PIONEERS—ELECTRICAL

BY E. M. CUTTING

Time was—when men were honored much
And only praised when they were dead;
Gathered friends to speak of love,
Heaping flowers o'er their head.
Of deeds of valor—virtues great,
Writers wrote and poets sung;
Epitaphs were carved in stone,
Anthems o'er the world were flung.
To honor them who still are here,
We have summoned on this day;
Those with courage—visions clear:
Those who pioneered the way.
They who harnessed waterfalls
That have their source among the snows
That bank along Sierra's crest,
And flowing down from dizzy height,
Dispel the gloom and banish night,
And truly make our Golden West.
They who labored many days,
Building—planning—working long,
To make Electric—all the ways
Of men—for them, this praise of song.

The entertainment of the executive committee of the N. E. L. A. by the Electrical Development and Jovian League of San Francisco on Dec. 5th was highly successful. A. H. Halloran of the Journal of Electricity, as chairman, introduced Russell H. Ballard, vice-president of the Southern California Edison Company, and founder of the Pacific Coast Section of N. E. L. A., and Capt. H. F. Jackson, president of this Pacific

Coast Section. They spoke of the amending of the constitution in order to include the contractor-dealer and of the efforts made to solve their problems as well as those of the central station.

That the important thing for the industry is for all electrical men of the various branches to come together, have one convention only per year, and consider this a clearing house for the exchange of ideas, was emphasized by A. Emery Wishon, assistant general manager of the San Joaquin Light & Power Co., H. C. Reid, president of the California Association of Electrical Contractors and Dealers, K. E. Van Kuran, Los Angeles manager of Westinghouse Electric & Manufacturing Co., Harry Bostwick, assistant to the first vice-president of the Pacific Gas & Electric Company, W. W. Briggs, general agent of the Great Western Power Company, and D. E. Harris, vice-president of the Pacific States Electric Company outlined the plan for two field men that are to be employed jointly by all branches of the industry in California to personally assist in bettering merchandising conditions in the West. J. E. Woodbridge, chairman of the engineering committee, described the problems in engineering that are now being studied by the Pacific Coast Section, N. E. L. A.

The meeting closed with a recital by G. Herb Palin of the Red Cross poem, his own composition. A unanimous vote of approval of the membership drive to be held on Dec. 16th for Red Cross members was given.

Institute Meeting in New York

The 335th meeting of the American Institute of Electrical Engineers was held in the Engineering Societies Building, New York, December 14, 1917. Two papers were presented at this meeting—"Magnetic Flux Distribution in Annular Steel Laminæ" by Dr. A. E. Kennelly and P. E. Alger, of the Massachusetts Institute of Technology, and "Phenomena Accompanying Transmission with Some Types of Star Transformer Connections II" by L. N. Robinson, of Leland Stanford Junior University. The latter paper is an amplification of Mr. Robinson's former paper presented at the Panama-Pacific Convention of the A. I. E. E., published in the Transactions, Vol. XXXIV, 1915, page 2183.

Jovian Electric League of Los Angeles

The Jovian League of Los Angeles met on Wednesday, November 28, 1917, with Mr. Chester Leatham, manager service department, Otis Elevator Company, as chairman of the day. Mr. George M. Wessells was the speaker for the occasion and gave the Demonstration of Salesmanship for which he is famous. The Ad Club awarded his Demonstration of Salesmanship the prize for the best educational feature of the year.

Paul D. Howse was chairman of the day for the meeting of Dec. 5th.

Nevada Contractors and Dealers Organize

Sunday, December 2nd will long be remembered as the turning-point for the electrical contractor-dealer business of Nevada. Electrical contractors and dealers of that state met at Reno for the purpose of discussing ways and methods of bettering conditions in the industry in that state, and before adjourning formed the Nevada Association of Electrical Contractors and Dealers. Mr. F. V. McAvoy was elected the first president of the baby organization among electrical associations of the Pacific Coast, R. W. Shearer was elected secretary, J. C. Broilli, treasurer and F. O. Broilli delegate to the Western Conference Board. The constitution and by-laws of the California Association was adopted in full as those which will govern the Nevada Association.

Ways of furthering the uses of electricity in Nevada and co-operating with the power companies were discussed and it is expected to put some of the ideas discussed into active operation at a not far distant date.

Los Angeles Synchronous Club

The second lecture of the Synchronous Club's electrical course on "Electricity and Magnetism" was given by Prof. J. C. Montgomery on Nov. 8th at the University of Southern California.

HAPPENINGS IN THE INDUSTRY

Personal Items

The West has again scored in competitive bidding against the country at large in a \$1,000,000 naval contract which has just been awarded in Washington to Charles C. Moore & Co.



Chas. C. Moore

It is for the construction of two big naval oil stations, at Pearl Harbor, Hawaii, and at a point near Bremerton, Wash. The work is to be completed within 270 days. This big new contract includes the oil tanks, the concrete construction, the interconnecting piping equipment and the buildings of this great work.

Charles C. Moore left Washington for San Francisco recently and upon his arrival

here is expected to speed up the work on the contract, so that the job will be finished well within the contract time.

L. W. Shirley, formerly general sales manager for the Link Belt Company at Chicago, Ill., is now located in Seattle, Wash., as secretary and manager of the Washington Corporation of the Link Belt Company, with plant and offices at 574-576 First Avenue South.

Nixon & Kimmel, electrical engineers and contractors of Spokane, Wash., have been appointed distributors for the Edison batteries and Edison farm-lighting plans for all territory east of the Cascade Mountains in Washington and all of Idaho and the western part of Montana. They are also distributors of the Robins & Myers motors, dynamos, the Sangamo meters and the Maloney transformers. Nixon & Kimmel have been located in Spokane for 20 years.

Harry A. Flood, president of the Spokane Heat, Light & Power Company, has sold his interests in the company to Field, Richards & Company, Cincinnati. Mr. Flood has resigned and will be succeeded by Ludwig Kemper, representative of Field, Richards & Company in Spokane. The holding company will be discontinued as a medium for controlling the operating company, the stock of which will be distributed share for share among shareholders in the holding company.

Charles W. Reid, vice-president of Rathbone, Sard & Company of Chicago, manufacturers of electric stoves and ranges, who has recently visited all of the larger cities of the Pacific Coast, and who has spoken enthusiastically before the San Francisco Electrical Development League on the possibilities of the West, has returned east after making important announcement of the new activities of his company in the West. The company will establish wholesale offices and a warehouse at Portland as a basis for its operations in the Northwest. Offices and salesrooms are at 306 Oak Street. R. C. Karberg of Spokane is the manager of the new Portland branch. Associated with him as sales manager is C. F. Jaques of Seattle. At San Francisco, J. M. Merritt is the local manager with Maurice S. Barnett as sales manager. 583 Mission street is the new factory headquarters. The entire organization is composed of enthusiastic, high grade men, and their entrance into commercial activity of the West means much for its future development.

New Power Loads

The Sierra and San Francisco Power Company of San Francisco has completed construction of a three-phase, 11,000-volt line from North Beach Power House, foot of Buchanan Street, to Washington and Mason Power House of the United

Railroads. This load was formerly supplied by the City Electric Company. Work has been started on an additional feeder of 350,000 c.m. 3 conductor 11,000-volt cable from North Beach Power House to the Turk and Fillmore Substation. An outdoor substation near Manteca, San Joaquin County, which is to supply the power for the sugar refinery recently erected in that vicinity by the Spreckels Sugar Co., is just about completed. A four-mile branch 60 kv. line has been completed, with an outdoor type substation, to supply energy to the Old Mission Portland Cement Company at San Juan, San Benito County.

Western States Gas & Electric Company has completed work on their part of the transmission system which will connect the distribution system of the Eureka division with the Northern California Power Company. The Northern California Power Company will complete its portion of the transmission line and connection will be made within six weeks, enabling the Western States Company to purchase additional hydroelectric power.

The new paper factory of the National Paper Products Company at Stockton, California, will be under construction soon on a 40-acre site recently purchased. The factory will cost \$400,000. It is hoped to have the plant in operation by May 1st, 1918. When completed the factory, equipment, machinery, etc. will represent an expenditure of \$1,250,000. The factory will specialize in box board and products made therefrom. The capacity will be 75 tons per day. Western States Gas & Electric Company recently secured contract for supplying power for operating this factory to the extent of 1,300 horsepower.

There are now eight electric furnaces in operation in the Puget Sound district of Washington, all engaged in the reduction of steel scrap. Two of these are of 3-ton capacity, the others being smaller. Several other electric-steel reduction works are in process of construction and more are contemplated. General interest in the electrical phases of the industry in that quarter is manifested.

Eight government vessels are under construction at the Marshfield (Ore.) shipyards at the present time, and the announcement is made that the shipyards will receive orders from the U. S. Shipping Board for as many more vessels as it is possible for them to build. The first vessel to be built by the Emergency Shipping Board will be launched by the Kruse & Banks yards.

Changes and Beginnings

The property of the Northern Idaho and Montana Power Company of Byllesby, including the Bigfork power plant, telephone and power lines and real estate, have been sold at public auction to Robert J. Graf for \$563,166. The Northern Idaho Power Company was put into the hands of a receiver last January at the request of Mathew A. Morrison, an unsecured creditor.

The San Diego Consolidated Gas and Electric Company is reported to be contemplating improvements to its plant.

The Philadelphia Storage Battery Company, Philadelphia, has opened a branch office and depot at 37 Spear Street, San Francisco. The company's first Pacific Coast branch was opened in Los Angeles a year ago. Arthur Affeld will have charge of the Los Angeles office and A. P. Clark will operate the San Francisco office. C. L. McWhorter, manager of the Pacific Coast division, will make his headquarters at the San Francisco office.

The Sierra and San Francisco Power Company has recently taken over the La Grange Division of the Yosemite Power Company's system and is now operating the same.

Electric Manufacturers Agency, Inc., has been incorporated with head offices at Seattle. This concern succeeds H. G. Behneman, Inc. Manufacturers' Agents and takes over the entire business of the old company, including all assets and liabilities. It will continue business at 617 Fourth Avenue, where its main offices and warehouse are located. Electrical specialties for all installations, also glassware for all installations will be handled. Following is a list of the officers: Joseph Schoemer, president and manager, George Buckman, vice-president, Water Funfsinn, secretary-treasurer. The territory included in its operations covers Washington, Oregon, Idaho, Montana and British Columbia.

The Snowflake & Taylor Mill Company of Snowflake, Ariz., has been incorporated by A. Z. Palmer and J. J. Shumway of Taylor; Walter H. Denham of Shumway; John A. Freeman, Samuel F. Smith, Joseph W. Smith and W. H. Shumway of Snowflake. The company is capitalized at \$50,000 and proposes to supply electricity in Snowflake, Taylor Mill and vicinity.

Good progress is being made in constructing the 10,000 kilowatt auxiliary steam plant of the City of Seattle Lighting Department. The framework is completed and the boilers are being installed. During the fall more contracts have been closed per month by the department than for any other period in the history of the plant.

A. H. Cox & Company, machinery and electrical equipment, 309 First Avenue South, Seattle, are moving their offices to 307 First Avenue South, one door north of the old location, where they will have four floors with a 65 foot front and 120 feet deep. Mr. Cox reports a most satisfactory business for the past year particularly with electrical equipment. Their new location will afford double the floor space they have heretofore had.

Must Carry Out Franchise Obligations

Judge John R. Mitchell of the Thurston county, Washington, Superior Court has dismissed the case wherein the Tacoma Railway & Power Company sought to be relieved from payment of gross earnings, taxes and street paving assessments. The decision means about \$100,000 saving for the city annually.

Aero-Dynamics Unit to Start

The first unit of an aero-dynamics laboratory, to be started on the campus of the University of Washington, is to be started shortly with funds donated by W. E. Boeing. First unit will be a wind tunnel eighty feet long and twenty feet square in which model aeroplanes will be tested. The course is to begin January 1 and will be in charge of F. E. McKone, professor of mechanical engineering.

Power Properties Sold

The properties of the Northern Idaho & Montana Power Company, including those at Newport, Washington and Sandpoint, Idaho and of the Oregon Power Company at Eugene have been sold at Newport, Wash., by order of the Federal court. George E. Worthington of Spokane, special master, made the sale. The property was bid in by John H. Roemer of Chicago, representing the reorganized companies. The total amount involved in the sale was \$5,016,773.

Seattle Municipal Line Loses

The city council authorized a sale of bonds for the Ballard Extension of the proposed municipal line and ordered the bonds to be paid out of the earnings of the municipal railway. Meanwhile the two lines operated by the city suffered a heavier loss from operation in October than in September. The loss in October, according to the report issued by the public utilities department, amounts to \$3,410.97, bringing the total losses of the railway since June 1st, 1914 to more than \$120,000.

Raise in Wage Schedule

The arbitration board sitting on the street railway strike issues has drawn up a memorandum of awards covering wages and working conditions for the traction employees of the

Puget Sound Traction, Light & Power Company and the Tacoma Railway & Power Company. The wage scale for conductors and motormen on the ordinary two-man electric cars was raised 4 cents an hour for each grade of employee.

	Seattle Scale.		Tacoma Scale.	
	Old.	New.	Old.	New.
	cents.	cents.	cents.	cents.
First six months.....	29	33	27	31
Second six months.....	30	34	28	32
Second year.....	31	35	29	33
Third year.....	32	36	30	34
Fourth year.....	33	37	31	35
Fifth year.....	34	38	32	36
Sixth year.....	36	40	34	38

This wage scale is to be in effect as of August 1, 1917. The existing extra pay for the operation of one-man cars and cable cars, and for the instruction of student operators continues.

Telephone Receipts

A statement of gross receipts for the local exchange service and the proportion of gross toll receipts creditable to the San Francisco exchange and accruing from telephones within the city from October 1, 1916, to September 30, 1917, was filed recently with the Board of Supervisors by the Pacific Telephone and Telegraph Company, as follows: Local exchange service totaled \$4,334,651.58 and toll receipts creditable to San Francisco exchange were \$292,819.51, at gross total of \$4,627,471.09.

Earnings of Western Power Company of Canada

The Western Power Company of Canada, Ltd., Vancouver, B. C., reports operating revenues for September, 1917, of \$37,887.31, a decrease of 2.6 per cent over the same month last year, and net earnings of \$26,757.04, an increase of .4 per cent compared with September, 1916. The net earnings for the year 1917 to date are \$239,488, compared with \$188,071 in 1916. For the twelve months ended September, 1917, the net earnings are \$330,205.86, an increase of 29.6 per cent over the twelve months ended September, 1916.

Interurban Firms Must Pay Industrial Insurance

Judge John R. Mitchell of Washington handed down a decision dismissing the suits brought by the Washington Water Power Company, the Spokane & Inland Empire Railway and the Yakima Valley Transportation Company against the industrial insurance commission. The carriers claimed exemption from the provisions of the industrial insurance law on the ground that the last legislature, in amending the law so as to include first aid and exempt interstate carriers from the operation of the act, had excluded all carriers doing an interstate business. The electric lines in question decided to test the matter in the courts and sued to restrain the commission from collecting premiums. Judge Mitchell in his opinion holds they must pay.

Alameda Will Re-Sell Power

The city of Alameda voted recently through the city council to buy electric energy for resale from the Great Western Power Company. The public utilities board of the city had, previously, signed a contract with the power concern but the contract required the approval of the city council to be binding. In addition, the council let the contract to the power company to construct a transformer station at North Pearl street and Blanding avenue for \$8771.

The city's electric light plant is unable to furnish profitably the day power needed by industrial concerns. The minimum charge per month for power is to be \$50, with a maximum of practically unlimited quantity, the rate of cost decreasing as the volume of current used grows.

It is possible that the city will now make an effort to supply the Union Iron Works which is now supplied electric energy by the Pacific Gas & Electric Company. The shipyards demanded more current than the municipal plant could supply and also secured from the Pacific Gas & Electric Company a lower rate than the cost of manufacture to the municipal plant. For this reason, after much agitation, the shipyard was permitted to bring "foreign" current into Alameda.

LATEST IN EVERYTHING ELECTRICAL

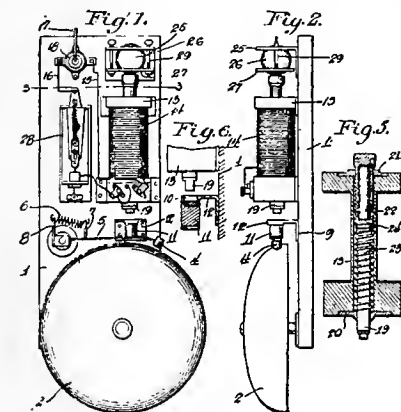
(The importance of not misunderstanding signals in operating mine hoists makes the improvement of the signal bell a matter of considerable interest. The way in which government orders are taking precedence over private demands has already been felt in the electrical field. A picture of Packard transformers en route and brief descriptions of new electrical apparatus gotten out by various manufacturers follow. —The Editor.)

SIGNAL BELL FOR MINE USE

A signal bell for use in mines has recently been invented by Beryl W. Adams of Troy, Montana. It is particularly adaptable for use in giving signals to the hoist engineers. The purpose is to provide a bell by which a single stroke

may be given in clear plain tones and at high speed without confusion.

It may be used in connection with an alternating current circuit and is so arranged that single stroke signals will be sounded irrespective of whether the energizing connection of the circuit is made of short or long duration, and the parts are so constructed that even when the circuit is



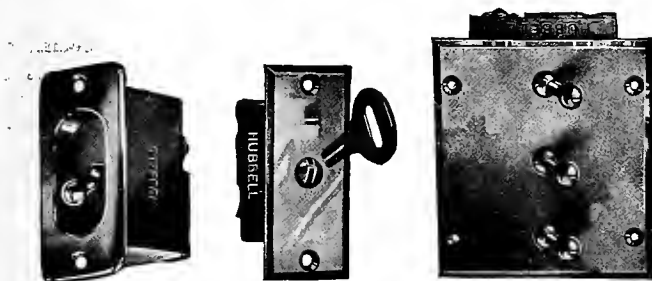
An improved signal bell

connected in for some time, no damage will result. The bell clapper will give a sharp stroke and strike a clear tone and will then be returned to an inoperative relation for successive alarm or signal strokes without depending upon electromagnetic or other electric means.

This device while very efficient is at the same time very simple in construction and operation and does not present any mechanism requiring delicate adjustments.

THE AUTOMOBILE TOGGLE SWITCH

The Automobile Toggle Switch, gotten out by Harvey Hubbell, Inc., was designed with a view toward effecting an improvement over the existing forms of switches for automobile use, such as those employing the miniature push button, or the single plunger type, which consists of pulling out and pushing in a small handle. The convenience of the Toggle switch will appeal to those who have had experience in



Automobile Toggle Switch

operating either of these types. To throw on the current, the Toggle handle is simply pushed up and the reverse operation opens the circuit. Another very important feature is the indicating arrangement of the Toggle. To the user of this switch it becomes second nature to press the handle up to turn on the lights and down to turn them off.

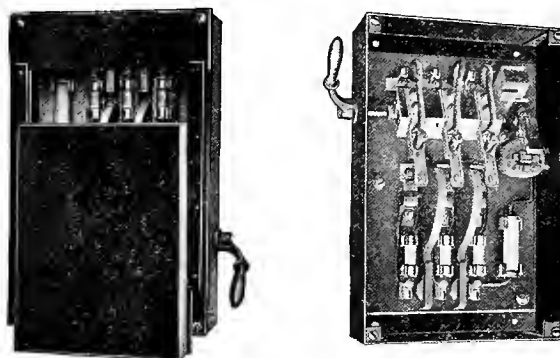
These switches have a sufficient carrying capacity to carry the load of almost any battery or magneto circuit and have successfully withstood the test as high as fifty watts.

The interior mechanism is very simply and strongly made. They can now be furnished in single pole and three-way types with flush plate—single pole and three-way with recessed plate—momentary contact type—double form of momentary contact—battery magneto circuits—single pole and three-way lock switches.

Lighting systems of more or less special character can be arranged by gang combinations made up of these various types.

A C-H ENCLOSED STARTING SWITCH FOR SQUIRREL CAGE MOTORS

The new C-H enclosed Starting Switch provides the motor with protection against overload and against unexpected re-starting after there has been an interruption in the circuit or failure of voltage. It also insures safety to the operator under all conditions, because he cannot touch a live



Enclosed panel removed showing interior of A.C. switch. The lowering of the panel interlocks the switch in the open position.

part while operating the switch, nor when inspecting or renewing fuses. The sliding panel, which encloses the contacts and fuses, interlocks with the mechanism so that the switch cannot be closed and the fuses are always dead when the sliding panel is in the lowered position.

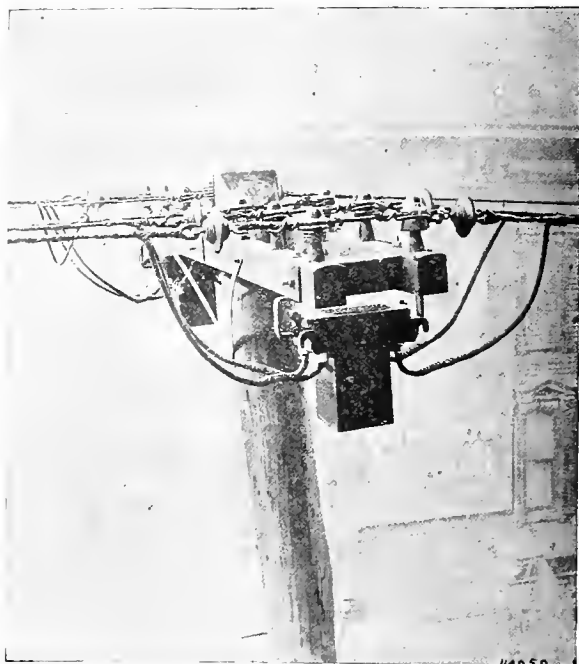
The fuses are not in circuit when starting but are automatically included in the motor circuit when the starting handle reaches the running position. The fuses can therefore be of sufficiently low capacity to give proper protection to the motor windings. Failure of voltage causes the switch to open. Unexpected re-starting with the resultant possibility of injury to operator or machine driven does not occur because the starting lever must be manipulated to again start the motor.

The interior parts consist of three moving contact fingers, which, when the starting lever is moved to the extreme upward position, make contact with three stationary contacts, connecting the motor directly to the line. After the motor is up to speed the hand is removed from the handle and the contact fingers slide into engagement with the running contacts, the change being made without opening the motor circuit. The capacity of this standard switch is 3 h.p., 110 volts; 5 h.p., 220 volts. It is designed and made by The Cutler-Hammer Mfg. Co., of Milwaukee.

COMPACT LINE SECTIONALIZING BREAKER

Pole-mounting, non-automatic oil circuit breakers have been supplied by the Westinghouse Electric & Mfg. Company

based upon an ingenious idea suggested by the Edison Electric Illuminating Company, Brooklyn. Galvanized iron straps are bent and drilled so as to be attached by one bolt to the cross-arm and by the cover-clamping bolt of the Type D non-

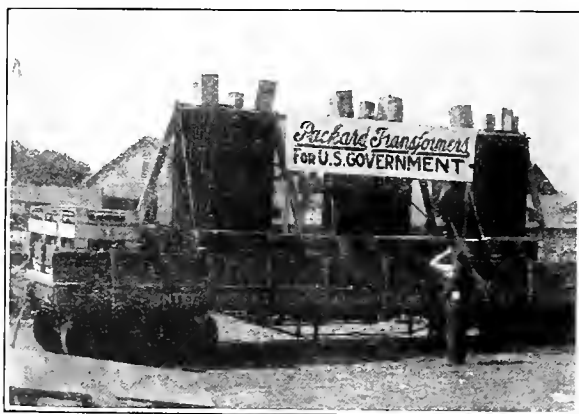


Line Sectionalizing Breaker on Brooklyn Edison Lines

automatic oil circuit breaker, longer bolts than standard 4,500 volt 2-phase wires being dead-ended on strain insulators tied together and supported by pin insulators.

WHY SOME ORDERS ARE HELD UP

Big electrical units are no longer a novelty, but we reproduce herewith a picture of three heavy-duty transformers which were delivered to Uncle Sam by The Packard Electric Company of Warren, Ohio. The picture will serve to reconcile



Loaded with transformers for the U. S. Government

some of our readers to the delays their orders have been subjected to owing to priority of government requirements. The electrical industry is being extended to the limit in this direction and the Packard Company has been doing its bit along with the rest of us.

TORPEDO STATION SWITCHBOARD

The Metropolitan Electric Company, 524 First Avenue South, Seattle, is engaged in the work of constructing a switchboard for the United States naval torpedo station at Keyport, Washington. On account of the uses to which the equipment will be put, the job is very much out of the ordinary. The contract amounts to about \$4000.

MEN WANTED FOR THE ARMY Ordnance Department

Electricians are wanted for early service overseas. The men in the front line trench need the help and co-operation of skilled men back of the lines, and men with experience in all lines of electricity are wanted at once for the Enlisted Ordnance Corps, National Army.

Uncle Sam is calling on our trade to come across and help his fighting men. There is a lot of work to be done over there, and the call has gone out for electricians between the ages of 18 and 40 who want to do their bit, and who know their job.

Modern war is a tremendous business, and the army that wins, is the army which has the best equipment and the best men. The men are over there now—they are ready to go ahead, but they still need experts in our line to repair and maintain their equipment. There is a fine chance for every man who wants to help.

Aviation Section of the Signal Corps

Here is a list of the kind of men wanted, arranged in the order of number of men needed:

Chauffeurs	Riggers (Airplane Assemblers)
Auto Mechanics	Telephone Linesmen
Automobile Engine Repair Men	Tool Makers
Office Clerks	Vulcanizers
Carpenters	Welders
Radio Operators	Lithographers
Electricians	Packers
Instrument Repair Men	Telephone Operators
Cooks	Motorcyclists
Coppersmiths	Plumbers
Armors (Machine Gun Repair Men)	Painters
Sail Makers	Tailors
Photographers	Gas Works Employees
Machinists	Buglers
Blacksmiths	Moulders
Motorcycle Repair Men	Pattern Makers
Stenographers	Telephone Adjusters
Cabinet Makers	Barbers
Draftsmen (Mechanical)	Truck Masters
Magneto Repair Men	Brick Layers
Metal Workers	Cobblers
Automobile Engine Testers	Propeller Testers (Airplane)
Rope Riggers (Cordage Workers)	Boat Builders
Propeller Makers (Airplane)	Saddlers
	Stock Keepers (Experts)

The Signal Corps

Electrical Engineers: The Signal Corps of the Army is in need of the services of electrical engineers, more particularly of those who have had radio-communication experience of some kind. The work is expected to consist of experimental trials of radio apparatus, in general laboratory work, and in the instruction of personnel in the use of new types of radio equipment. Those who believe that their training or experience fit them for service of this character are requested to communicate with the Secretary of the Institute, 33 West 39th St., New York, stating fully their education, experience and their exact present status in the draft.

Electricians: Training schools for temporary specialists of the Coast Artillery Corps were opened about Nov. 19, 1917. Men who have had an electrical education equivalent to two years college work or who are thoroughly familiar with electricity and electrical apparatus and are now proficient in mathematics should apply for this course. They will be fitted for Electrician Sergeants, 2nd Class, who are charged with the care, operation and repair of electrical installations at Coast Artillery posts, which include power plants, telephone systems, searchlights, gasoline engines, cable repairs, etc. The monthly rate of pay is \$44.00 for first enlistment, with promotion as vacancies occur to Electrician Sergeant, 1st Class at \$51.00 per month; Engineer \$71.00 per month, and Master Electrician at \$81.00 per month.

Mechanical Draftsman: The Ordnance Department needs mechanical draftsmen and, unless the situation is corrected, war preparations will be seriously retarded. An intelligent investigation will be made of the fitness of every volunteer and such volunteer given an immediate rating according to ability.

BOOKS AND BULLETINS FOR ELECTRICAL MEN

Upbuilding the Industry

The Engineering Experiment Station at Purdue University is described in a pamphlet gotten out by the Engineering departments of that college.

Circular No. 68 of the Bureau of Standards is entitled "Public Utility Service Standards of Quality and Safety." A brief description of the work done and the material contained in other circulars under the heading "Standards for Electric Service" is here given, together with a synopsis of the National Electric Safety Code and an account of the work done toward Electrolysis Mitigation. A rather complete listing of bulletins on these subjects forms the main subject matter of the pamphlet.

"Approved Electric Lamps for Miners" is the title of Bulletin 131 of the Bureau of Mines, Department of the Interior, just issued. The authors are H. H. Clark and L. C. Hsley. This bulletin describes the development of a number of types of lamps that meet the requirements, and discusses in detail the features and qualities of these lamps, which in November, 1916, were being put into use by mine operators in this country at the rate of about 2,000 a week. Those lamps that meet a certain minimum specification are approved by the Bureau of Mines. No manufacturer is required to obtain this approval, but the manufacturers have voluntarily submitted their lamps for investigation and criticism. None of the lamps submitted to the bureau was found acceptable in its original form, and the co-operation with the Bureau of Mines of the makers of lamps, bulbs, and cords has extended over the past three years, and the art of making safe miners' electric lamps has thereby been developed much more rapidly than would have been the case had the development been solely the result of commercial exploitation. Also, it is believed that by this method the mining public has been saved expensive and dangerous experiments, which might have cost many lives and for a time condemned the electric lamps as an impracticable device.

Books and Bulletins on the War

The American Red Cross has recently issued a book of some 150 pages which interestingly describes its work at home and abroad. In view of the Christmas membership drive now being launched, the book is one of particular interest.

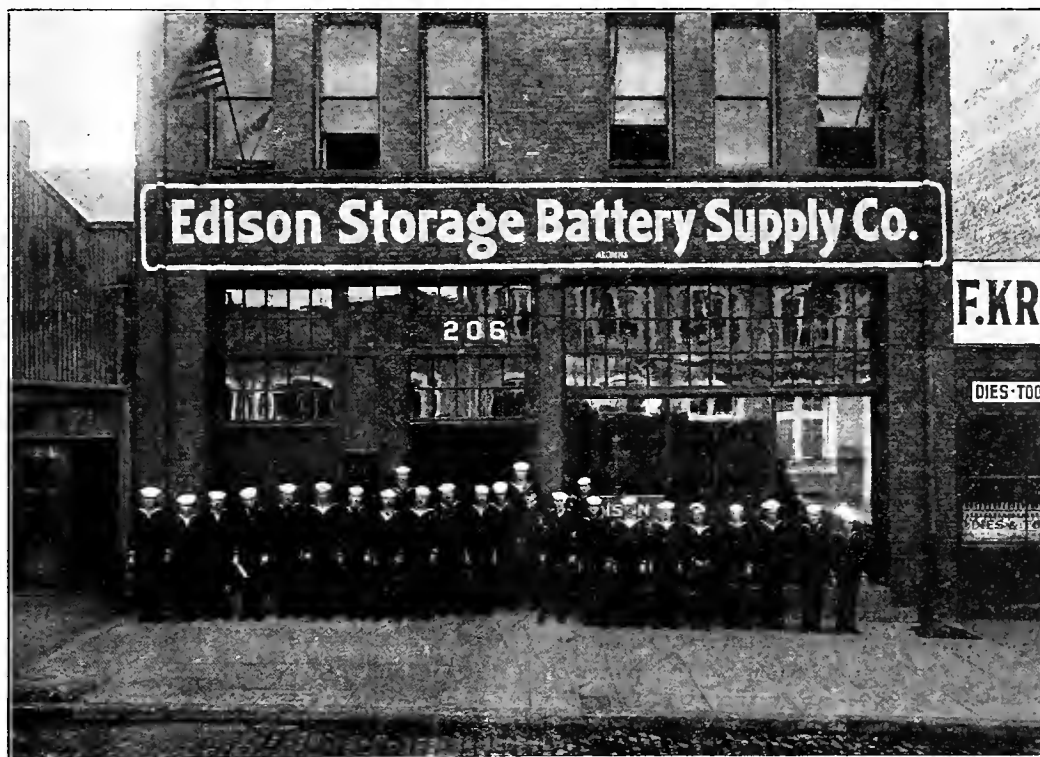
"A Reference Book for Speakers" is the title of a little booklet published by the League to Enforce Peace of which Wm. H. Taft is President. The matter here presented is such as would provide suggestive arguments for the 4-minute men and other speakers on patriotic subjects.

German preparations for trade after the war are being scrutinized carefully by experts in the Bureau of Foreign and Domestic Commerce, of the Department of Commerce, and the recent important report on the subject of "German Foreign-Trade Organization" by Chauncey D. Snow, which touched on this point, has been in such great demand as to establish a new sales record for Government trade reports. The Bureau now plans to get out a supplementary bulletin on German trade and preparations for the commercial future about the first of the year, and further supplements as rapidly as important additional information is received.

Of Interest to the Trade

A 24-page booklet on Condensite has recently been given to the trade by the Condensite Company of Bloomfield, N. J. An idea of the almost unlimited diversity of uses to which Condensite has already been put can be obtained from the statement that it is used for buttons, tobacco pipes, golf clubs, insulating parts of all kinds, commutators for automobile horns, printing wheels for typewriters, vending machine bases, Edison Diamond Disc phonograph records, and for a multitude of other mechanical uses.

A new device for sending money through the mails is being advertised by the Lindley Box and Paper Company of Gas City, Indiana.



HELPING TO WIN

A few Navy boys from Mare Island visit the Edison Plant at San Francisco to learn how a storage battery is made. The management has further supplied parts of the battery for classroom instruction and will later give an illustrated talk for the class

NEW ELECTRICAL DEVELOPMENTS

(A six million dollar power plant to be built on the Feather River, California, progress in the electrification of railroads in the Northwest, the shutting down of the steam plant in Pasadena and the substitution of power from the Southern California Edison Company and plans for obtaining power for mines in the Intermountain district are the events which mark the activities of the month to date.—The Editor.)

THE PACIFIC NORTHWEST

PORTLAND, ORE.—Portland Railway, Light & Power Company has completed plans for the erection of a pump house on the water front at the foot of Nicolai street at a cost of \$1025.

WHITE SALMON, WASH.—With the recent purchase of two lots in White Salmon by the Pacific Power and Light Company it is learned that a large sub power station to serve the city is to be erected soon.

EPHARATA, WASH.—The Doerr-Mitchell Electric Company of Spokane has the contract for equipping the new court house at this place with electrical fixtures at \$1200. The outfit will be manufactured at the factory of the company.

SEATTLE, WASH.—The Moran Manufacturing Company, 1220 First Avenue South, has secured the contract for furnishing the high pressure fire pump for the new harbor patrol boat for the city of Seattle, contract amounting to \$1765.

PORTLAND, ORE.—Chief Engineer Hergardt has been authorized by the Commission of Public Docks to ask for bids on motors and transformers for the St. Johns terminal project, which includes municipal grain elevator and additional dock space.

WALLA WALLA, WASH.—Pacific Power & Light Company has made application to the commissioners of Walla Walla county for the right to erect, operate and maintain electric power transmission lines over certain highways of the county.

SUNNYSIDE, CAL.—The street lighting system is partially completed and the constant current transformer has been connected and put into service to supply about 30 lights. The balance of the system will be cut in as soon as the necessary line work can be completed.

PROSSER, WASH.—The city council has voted to accept the lighting contract tendered by the Pacific Power & Light Company. This is a 10-year contract and provides for additional lights and the changing of the system to the incandescent type to replace the arc lights.

ST. HELENS, ORE.—The Milton Creek Logging Company, which operates a large camp about seven miles west of this place, recently installed an electric light plant at the camp and the cookhouses, locomotive sheds, bunkhouses and clubrooms are now all electric lighted.

VICTORIA, B. C.—C. H. E. Williams, Securities Building, Seattle, has the contract for installing electrical equipment including lighting and power in the assembling plant at this place being erected by Grant Smith & Company and McDonald Ltd. for the Imperial Munitions Board.

TACOMA, WASH.—The city council has voted to extend the present municipal car line approximately one mile on the tide flats at a cost of about \$18,000. The public department has received the block and signal system for the municipal car line and it will be installed at once.

SILVER LAKE, ORE.—Work on the \$900,000 Ochoco irrigation project is progressing rapidly. Eight cars of equipment have been shipped from Seattle, one item of which is a 650 horsepower electric motor, for which a power line is to be built at once by the Deschutes Power Co.

SEATTLE, WASH.—At a recent special meeting of the city council an existing ordinance, providing for a bond issue of \$40,000 to make the Ballard extension of the city car line,

was amended by providing that the issue may be raised in the future to \$125,000, bonds to be retired in from three to 12 years.

TACOMA, WASH.—C. D. Atkins, commissioner of public works, reports to the city council that the Foundation Company desires double track laid from its plant to the viaduct, offering to pay for construction if the city will do the work and furnish equipment for the car line. Cost would be about \$15,000.

RENTON, WASH.—Plans have been completed by the engineering department of the Milwaukee & Puget Sound Railway Company for construction of a reinforced concrete substation here together with three bungalows. This substation is a unit in the electrification of the company's road over the Cascade mountains and will cost about \$75,000.

SEATTLE, WASH.—The city council has appropriated \$38,200 for the second section of the northerly extension of Division A of the municipal car line from Market and Leary streets to the intersection of the Loyal Heights line at 23rd Avenue Northwest and West 67th street and \$22,000 for the double tracking of the municipal line on Nickerson street.

GOLD HILL, ORE.—The Grants Pass-Gold Hill irrigation project, taking water from the south side of Rogue river above Gold Hill, will probably be enlarged according to plans of the city of Gold Hill. The final survey by the engineers in charge covers the McClure dam site and ditch owned by the city of Gold Hill, which controls water to develop 500 horsepower.

ONTARIO, ORE.—Orders have been issued by the board of directors of the Owyhee Irrigation District for a pumping plant to insure sufficient water for the irrigation of the Owyhee lands at all seasons. The plans call for a two-unit plant, including two motors and two pumps, with a capacity of 27,000 gallons per minute. It will be necessary to construct a pipe line besides the motors and pumps, which will cost about \$2500 additional. The motors and pumps will cost \$15,000.

SEATTLE, WASH.—The Chicago, Milwaukee & St. Paul Railroad Company has awarded contracts amounting to nearly \$2,000,000 for electrical equipment for its new electrified division. The equipment contracted for includes 17 electric locomotives at an average price of about \$100,000 each and substation machinery for the 216-mile Othello-Seattle-Tacoma division. The orders were divided between the Westinghouse Electric & Manufacturing Company and the General Electric Company.

ROSEBURG, ORE.—The big California Oregon Power Company dam at Copco, Cal., on the Klamath River, is completed and the reservoir has now started to fill. The dam is 95 feet across at the base and 500 feet at the top. It develops 26,000 horsepower now and as much more can and will be developed later. The power generated will be used in the various projects of this corporation in this part of the state. By the construction of a similar dam just below the present structure the company plans eventually to bring the total horsepower up to 103,000.

TACOMA, WASH.—The city is considering the different power sites that are being offered, in view of the fact that it is necessary to acquire more electrical energy at the earliest possible moment. F. K. Owens, owner of a power site on the Stillaguamish river near Everett, recently made an offer to sell it to the city for \$4,000,000 and J. H. Cunningham, hydraulic

engineer of Portland, has offered the city a power site on the headwaters of the Cowlitz river within 58.8 miles of the city, upon which \$260,000 worth of preliminary survey and construction work has been done.

THE PACIFIC CENTRAL DISTRICT

MERCED, CAL.—Steps are being taken to take over the electric light, gas and water systems. The city engineer is preparing an estimate of the cost.

MERCED, CAL.—A crew of workmen is installing a power line to Coulterville, Mariposa county, where the streets and houses are to be electric lighted soon.

MODESTO, CAL.—The Tidewater Southern line is planning to complete its 10-mile extension to Livingston. It is also planning to electrify the line southward from Modesto.

MENDOCINO, CAL.—The Fort Bragg Electric Light Co. has decided to place meters in all places where current from its lines is used. The company will place additional street lights where necessary.

OAKLAND, CAL.—The Pacific Telephone & Telegraph Company has let the contract for structural steel work on its new office building to be erected at 15th and Franklin streets, and work will start at once.

BISHOP, CAL.—The Railroad Commission has extended the time in which the Bishop Light & Power Company may complete its reconstruction work—one-half to be completed before Dec. 31, 1917, and the entire work before June 30, 1918.

REDDING, CAL.—Owing to the difficulty of getting supplies into the Big Bend country on the Pit river, the Pacific Gas & Electric Company has shut down its work on the seven-mile tunnel it is building at a cost of \$17,500,000. Work will be resumed in the spring.

OAKLAND, CAL.—Alleged unpaid franchise taxes due the city from the San Francisco-Oakland Terminal Railways, aggregating in the neighborhood of \$1,000,000, have been discovered by City Clerk L. W. Cummings and brought before the council by Mayor John L. Davie, who instructed the city attorney to start proceedings to collect.

YREKA, CAL.—Word has been received here that the water which has been impounding behind the big California-Oregon Power Company dam at Copco has risen the 112 feet to the top of the dam much quicker than anticipated, and begun running over the top. The power company expects to have water running through the pipes and generating electricity by December 15th.

MERCED, CAL.—The proposition of increasing the scope of the proposed irrigation district movement to include a larger project to handle drainage, electric power and a telephone line was instituted at the meeting of the Livingston farm center when the resolution favoring the irrigation district plan, recently endorsed by the directors of the county farm bureau, was presented to the Livingston center for ratification.

SACRAMENTO, CAL.—A proposal for the city of Sacramento to buy the building at present occupied by Weinstock, Luhrin & Company, Fourth street, K to L, for the purpose of transforming the large structure into an auditorium and union passenger station for all electric railways entering this place is soon to be made. While details have not been worked out, it has been learned that the property can be purchased for \$375,000.

STOCKTON, CAL.—An application has been filed by the Western States Gas & Electric Company with the State Water Commission asking permission to appropriate 5,000 acre-feet from Medley Lake and 7,000 acre-feet from Echo Lake, both in El Dorado county, and 8,000 acre-feet from Twin Lakes in Alpine county, for the purpose of developing 2500 horsepower at the hydroelectric plant of the American Electric Company for a period of seven months in the year.

VISALIA, CAL.—Announcement has been made of a complete reorganization of the administrative system of the

Mt. Whitney Power & Electric Company, a subsidiary of the Southern California Edison Company. In place of the large number of small commercial offices scattered through the county, hereafter the business will be handled through three divisional points, with headquarters in Visalia, Tulare and Porterville.

MODESTO, CAL.—The Modesto plant of the Sierra & San Francisco Power Company is installing, as rapidly as possible, improvements on the plant, which will cost \$30,000. This is being done in order to accommodate the rapidly increasing demand for power and light service in this community, as a result of factories, business houses and dwellings in construction or operation.

EUREKA, CAL.—During the week ended November 3rd the Eureka division of the Western States Gas & Electric Company secured a contract with the California Central Creamery for the power requirements of their new plant at Arcata. The Rolph Ship Yards are being supplied an additional 40 horsepower in motors. The Western States Company is now negotiating with the Arcata Barrel factory for the power requirements of their new factory, estimated at 150 horsepower.

CLOVIS, CAL.—The Fresno Flume & Lumber Company has filed notice of application for 200 cu. ft. per second of the waters of Dinkey Creek, tributary of Kings River, for power purposes. The plans provide for a main ditch, tunnel and pipe line 4½ miles long, and the storage of 25,000 acre feet of water. The company has also filed an application for 400 cu. ft. per second of water in Big Creek, also tributary of Kings River, the water to be used in connection with the above power project. The main ditch and pipe line in the latter is given as 8 miles in length.

OROVILLE, CAL.—The Great Western Power Company has purchased 1255 acres from E. E. Biggs and the land will be the site upon which the new \$6,000,000 power plant of the power concern will be built. The tract commands a frontage of 2½ miles on the Feather River. The water for the new plant will be diverted from the North Fork of the Feather River immediately after it leaves the Las Plumas plant of the company. It will be carried in a huge concreted canal to a point about two miles north of Oroville, where it will be dropped a distance of 500 feet into the power plant. The rights-of-way for the canal have already been obtained. The plant is intended to generate about 60,000 horsepower.

SAN FRANCISCO, CAL.—United Light & Power Company, represented by F. C. Riley and G. W. Gilbreth, of Los Angeles, has applied to the California State Water Commission for permission to appropriate 15 cubic feet per second from the waters of San Gabriel River in Los Angeles county for use in generating electric power for commercial purposes. Power is to be generated by impulse wheels direct connected to electric generators. A total fall of 1280 feet will be secured and 10,000 horsepower will be generated. The proposed work includes the driving of a tunnel and pipe line two and one-half miles long, the construction of a dam 200 feet high and 500 feet long. Construction is to be completed in two years and the entire appropriation of water is to be utilized within five years.

THE PACIFIC SOUTHWEST

EL CENTRO, CAL.—Bids will be received up to December 18th, for \$1,500,000 Imperial irrigation district bonds.

LOS ANGELES, CAL.—The California Railroad Commission has authorized the Southern Sierras Power Company to operate in Blythe, Cal.

SAN FERNANDO, CAL.—The board of trustees has appropriated \$2000 for the lighting of a portion of McFarland street which is now being re-graded and paved.

YUMA, ARIZ.—The mayor failed to sign a resolution passed by the city council calling for an election to vote bonds to purchase the plant of the Yuma Light, Gas & Water Co.

VENTURA, CAL.—The contract for the installation of an ornamental lighting system in District No. 1 of Ventura has been let to G. W. Sparks of Los Angeles on his bid of \$4665.

WILLIAMS, ARIZ.—An ordinance has been adopted by the common council providing for the issuance, advertisement and sale of the \$35,000 electric light plant bonds and \$55,000 waterworks bonds voted on Nov. 6th.

HOLTVILLE, CAL.—The Railroad Commission has extended the time in which the Holton Power Company may complete its work. At least half of the reconstruction work must be completed before Dec. 31, 1917, and the entire work before Dec. 31, 1918.

LOS ANGELES, CAL.—The council has adopted the report of the finance committee recommending that the city attorney, city engineer and city electrician prepare an ordinance for the installation of an ornamental lighting system in the Van Nuys district.

LOS ANGELES, CAL.—Sealed bids will be received by the board of public works up to Jan. 7, 1918, for furnishing the necessary lighting posts and appliances for lighting North Broadway between California and 1st streets, and Broadway between 1st and 10th streets.

YUMA, ARIZ.—Application has been made to the board of supervisors by Wm. Kryger for a franchise to construct a pumping plant on Colorado River at a point in Yuma county, and pipe line system therefrom to Yuma mesa, for the purpose of providing irrigation water.

RIVERSIDE, CAL.—The Railroad Commission has extended the time in which the Southern Sierras Power Company may complete its reconstruction work. One-third is to be completed before Dec. 31, 1917, two-thirds before Dec. 31, 1918, and the entire work before June 30, 1919.

TEXICO, N. M.—The State Line Utilities Company has been granted a franchise by the Board of County Commissioners to erect a high-tension transmission line from its power plant, which is to be located at Texico, along the road connecting Texico and Clovis and south to Portales.

SAN DIEGO, CAL.—An ordinance has been adopted by the board of supervisors granting the San Diego Consolidated Gas & Electric Co. a franchise for the construction of poles and wires for transmitting electricity within San Diego county, outside the boundaries of incorporated municipalities.

LOS ANGELES, CAL.—The immediate purchase of enough aqueduct power bonds to build municipal power plant No. 2, by the city, with the sinking fund will be recommended to the city council by Mayor Woodman. This plant in San Francisco canyon, developing 25,000 h.p., will cost about \$750,000.

PASADENA, CAL.—The city of Pasadena, where the electric light and power business has been divided for many years between the municipally-operated plant and the Southern California Edison Company, has made a proposition to the Edison Company which the latter accepted, on the lines of the contract made last May with the city of Los Angeles. By this arrangement the steam plant of the city will be shut down and the power supplied by the Southern California Edison Company from its hydroelectric plants.

INTER-MOUNTAIN DISTRICT

TROY, MONT.—A franchise has been granted the Snowstorm Mining Company for electricity. Owner, Kootenai Light & Power Company.

MISSOULA, MONT.—The State University campus is to be electrically lighted. Plans for the improvement are being prepared and it is understood the work will be done this year.

BRIGHAM CITY, UTAH.—The Reclamation Power Company has filed an application with the state engineer for 28 sec. ft. of water in Boxelder Creek, to be used for generating electricity.

HARLEM, MONT.—At a recent meeting of the council the bid of the Electric Construction Company for installing the ornamental lighting system was accepted. The work will cost \$4340.

EAST HELENA, MONT.—The Forestry Department has granted Jacobs & Flatow of East Helena permission to divert water from the McClellan Creek to develop power to be used in mine development work.

MILFORD, UTAH.—Higher telephone rates in Utah are announced by the Mountain States Telephone and Telegraph Company at Milford. The new rates will go into effect as soon as the new exchange building is completed. The commercial rate will be \$42 instead of \$36, and the two-party line will be \$36.

SALT LAKE CITY, UTAH.—The creation of a special lighting district on Regent street is asked by property owners in a petition filed with the city commission. It is proposed to light the street with a series of 6.6 ampere lights. The matter was referred to the department of streets and public improvements.

SALT LAKE CITY, UTAH.—Preparatory to carrying on extensive development and mining activities in the spring, the Earl Eagle, the Bellerophon and the Globe Consolidated Mining companies have joined in constructing a power line to their properties in the Mary Ellen Gulch of the American Fork mining district.

ELY, NEV.—Plans are being considered for the construction of a large hydroelectric development to supply electricity to the large copper mines in Ely. The installation will provide for an output of 4800 h.p. and will cost about \$1,200,000. The company expects to develop 10,000 h.p. in three years. F. B. Ench of Oakland, California, is interested.

SALT LAKE CITY, UTAH.—Oregon Short Line Railroad is planning to spend about \$1,000,000 for building about 40 miles of feeder lines in northern Utah and southern Idaho. Specifications provide for an extension of 3.85 miles to Baker spur north of Brigham and 9.65 miles from Garland to Beaver River City. Other improvements are to be made in southern Idaho.

CARSON CITY, NEV.—A formal protest by Nevada against the appropriation of 40,000 acre-feet of water from the Little Truckee River in the Doyle district, Lassen county, will be presented the California Water Board. The water is desired by the Long Valley Irrigation Company, but the Nevada authorities assert there is no unappropriated water along the Truckee.

CARSON CITY, NEV.—Through a co-operative agreement signed by the United States Bureau of Irrigation investigation and the state engineer of Nevada, arrangements have been made for a great irrigation project which includes the straightening of the Humboldt River and the building of several reservoirs along the stream for the storage of water. Owners of water rights and land owners along the Humboldt River have consented to the plans.

POSITIONS WANTED

FOR SALE—1600 feet of 3-0 stranded 3 conductor core rubber insulated covered cable C.L.A. finish, in good condition. For further particulars write to R. Nenzel, Lovelock, Nevada. 12-15

FOR SALE—One 50-kw. Allis Chalmers D.C. Generator, 240 volts, Direct connected to 12 x 11 Chandler & Taylor steam engine, 290 r.p.m. unit can be separated. Roth Blum Packing Co., San Francisco. 1-15

Electrician with good technical education and twelve years practical experience desires position as foreman with manufacturing firm, power station or similar work. Address Box 915 Journal of Electricity, S. F.

Ad-itorial Comment

(Each advertisement in the Journal's pages is good, it has news value and possible use for every reader. Some ads are better than others, either in display, text or timeliness. And in some one's opinion one ad is best. The publishers and advertisers are interested in knowing what the readers think is the one best ad and why. For the best statement of any advertisement's excellence in the next issue, that of Jan. 1, 1918, the publishers offer a prize of \$5.00. This competition is open to any reader. Merely write out the reasons why you like some ad and send it to The Aditor, Journal of Electricity, San Francisco. The winning statement will be published in the Feb. 1st issue. These articles should not exceed 150 words in length.—The Ad-itor.)

Plant protection by light projection is the dominant thought in the display advertising columns of this issue. **Crouse-Hinds Company** advise that "night prowlers shun plants illuminated by Imperial flood light projectors," and illustrate five of the many styles they make. **Federal Sign System (Electric)** suggest that "Federal Electric signs protect as well as advertise your place of business" and bring out the adaptability of electric signs to this dual service. **Western Electric Co.** advertise "electric daylight for protection" by means of Davis flood lamps. A typical installation is clearly shown. **Pacific States Electric Co.** present a striking picture of the Marin substation of the Pacific Gas & Electric Co., protected by nine G-E flood light projectors, a typical projector also being shown. **General Electric Co.** portray in a two-page spread the actual installation used by the authorities to protect the East River Bridge at New York City, under the slogan "The new national guardian—flood-lighting."

This patriotic note is sustained by **Baker-Joslyn Company**, Pacific Coast distributors for Duraduct, in announcing that Duraduct is on the list of "the best" that is being sent to France. The Tubular Woven Fabric Co. has been sustained by the United States Circuit Court of Appeals in a decision dated Nov. 14th in its long-standing patent litigation.

Baker-Joslyn Co. are also Pacific Coast distributors for **V.V. Fittings Co.** who devote a page to demonstrate the ease, and consequent profit, of using V.V. fittings for conduit wiring.

Whatever saves labor on a wiring job saves money for the contractor. This is why **The American Conduit Manufacturing Co.** recommend "Wiremold" which any workman can easily install with a hacksaw and screw-driver.

"Quality plus service" in an electric motor is advertised by the **Crocker-Wheeler Co.** who also make a strong point of a large stock in San Francisco and Los Angeles ready for immediate shipment.

Progress profits from the past. No branch of the electrical business has shown greater progress than the insulator manufacturers. **The Locke Insulator Mfg. Co.** call special attention to their new Victor No. 5090 for 60,000 volts.

Sprague Electric Works feature their ability to immediately fill any order for a reasonable quantity of small single-phase motors.

The Egyptian pyramids are famed for permanence. Consequently the **National Carbon Company's** three pyramid trademark back of their carbon brushes is a fitting symbol for brush service.

The especial attention of industrial plant managers and of contractors is called by **The Youngstown Sheet & Tube Co.** to their Realflex armored conductor. The Electric Agencies Co., Pacific Coast representatives, have announced that hereafter they will do no jobbing business, but will act strictly as manufacturers' representatives for the various lines they carry.

The Habirshaw Electric Cable Co. call attention to their general educative efforts to the end that owners should employ expert contractors. This carries with it the suggestion that the electrical contractor will benefit by tying in with this work.

The running quietness of a **Century Electric Company's** motor is exemplified by its illustrated application to an organ blower in a church, where quietude is essential.

Westinghouse Lamp Co. show a map of the Pacific Slope states with specific designation of the location of all their distributors. This organization is particularly active in backing up its distributors with a sales and advertising service.

The double-jewelled ball bearing of the type OA watt-hour meter is given prominence by the **Westinghouse Electric & Mfg. Co.** as an important feature in securing sustained accuracy. A meter's excellence is dependent upon perfection in its smallest parts.

Electricity fully repays its debt to the copper industry by its indispensable aid as a refining agent. **The Westinghouse Electric & Mfg. Co.** show an installation where nearly 70,000 amperes is being applied to this purpose through Westinghouse booster converters.

The Electric Storage Battery Co. demonstrate the applicability of the "Ironclad Exide" battery to the electric commercial vehicle. They cite the satisfaction given to users of this battery as proof of its worth.

Insurance against defects in Peirce Presteel brackets is automatically given by **Hubbard & Company's** process of manufacture. They not only thus provide adequate line insurance but also provide a bracket for every need.

Detroit Fuse & Mfg. Co. emphasize the safety features of their steel enclosed switches which are rapidly becoming standard for industrial installations. With the tremendous increase in the number of Western industrial plants a large field of application seems open to this equipment on the Pacific Coast.

That specific installations constitute one of the best means for proving satisfactory service rendered is exemplified by the **General Electric Company's** citation of the 86 miles of G-E electric wire and cable used in the new Chicago plant of the Crane Company.

ALPHABETICAL INDEX TO ADVERTISERS

American Ever-Ready Works of National Carbon Co..... Los Angeles; 755 Folsom St., San Francisco; Seattle.	Moore & Co., Charles C..... 8 Van Nuys Bldg., Los Angeles; Spalding Bldg., Portland; Kearns Bldg., Salt Lake City; Sheldon Bldg., San Francisco; Mutual Life Bldg., Seattle; Santa Rita Hotel Bldg., Tucson.
Associated Engineering & Supply Co..... San Francisco, Southern Pacific Bldg., Los Angeles-Portland, Vancouver, B. C.	Nason & Co., R. N..... 151 Potrero Ave., San Francisco.
American Electric Heater Co..... Detroit, Mich.	National Lamp Works of G. E. Co..... 6 (All Jobbers.)
American Conduit Mfg. Co..... 6 (See Pacific States Electric Co.)	New York Insulated Wire Co..... 629 Howard St., San Francisco.
Baker-Joslyn Company.....2-3 71-75 New Montgomery St., San Francisco; 526 First Ave. South, Seattle; 353 Second St., Los Angeles.	National Carbon Co..... 23 Cleveland, Ohio.
Benjamin Electric Manufacturing Co..... 590 Howard St., San Francisco.	Okonite Co. (The)..... 28 (All Jobbers.)
Century Electric Co. 11 906 So. Hope St., Los Angeles; 56 Natoma St., San Francisco; 65 Front St., Portland, Ore.	Pacific States Electric Co..... 23 236-240 So. Los Angeles St., Los Angeles; 61-67 Fifth St. No., Portland; 200-210 Twelfth St., Oakland; 575 Mission St., San Francisco; 570 First Ave. So., Seattle; 402 Paulsen Bldg., Spokane, Wash.
Crocker-Wheeler Co. 8 87 New Montgomery St., San Francisco; 228 Central Avenue, Los Angeles.	Peerless Electric Co..... 28 Warren, Ohio; Rialto Bldg., San Francisco.
Cutler-Hammer Manufacturing Co..... 579 Howard St., San Francisco; Morgan Bldg., Portland, Ore.; San Fernando Bldg., Los Angeles.	Philips Wire Co..... 9 Eighth and Santee Sts., Los Angeles. 84 Marcon St., Seattle; 807 Mission St., San Francisco;
Crouse-Hinds Company..... 7 Syracuse, N. Y., U. S. A. New York, Boston, Cincinnati, Chicago.	Pierson, Roeding & Co..... 19 Pacific Electric Bldg., Los Angeles; Rialto Bldg., San Francisco; Colman Bldg., Seattle.
Detroit Fuse & Manufacturing Co..... 5 1404 Rivard Street, Detroit, Mich.	Pittsburgh Piping & Equipment Co..... 28 Monadnock Bldg., San Francisco.
Davis Slate & Mfg. Co..... 19 Chicago, Ill.	Society for Electrical Development..... United Engineering Societies Bldg., New York City.
Detroit Insulated Wire Co..... 9 71 New Montgomery St., San Francisco; 353 East Second St., Los Angeles; 526 First Ave. South, Seattle.	Sangamo Electric Company..... Springfield, Ill.; San Francisco, 37 Stevenson St.; Los Angeles, San Fernando Bldg.
Edison Lamp Works of General Electric Co..... 25 Rialto Bldg., San Francisco; 724 So. Spring St., Los Angeles.	Southern Pacific Co..... 9 Southern Pacific Bldg., San Francisco.
Edison Storage Battery Supply Co..... 19 206-8-10 First St. (near Howard), San Francisco.	Sprague Electric Works..... 23 Rialto Bldg., San Francisco; Colman Bldg., Seattle; Corporation Bldg., Los Angeles; Electric Bldg., Port- land; Paulsen Bldg., Spokane.
Electric Agencies Co. 279-283 Minna St., San Francisco; 419-421 E. Third St., Los Angeles; 1252 First Ave. South, Seattle.	Standard Underground Cable Co..... 19 First National Bank Bldg., San Francisco; Hibernian Bldg., Los Angeles; Central Bldg., Seattle, Wash.; 815 Newhouse Bldg., Salt Lake City, Utah.
Electric Storage Battery Co..... 20 1536 Bush St., San Francisco.	Thomas & Co., R. Pacific States Electric Co. and Western Electric Co., Pacific Coast Representatives.
Electric Railway and Manufacturers' Supply Co..... 20 34 Second St., San Francisco.	Tubular Woven Fabric Company..... 2 Pawtucket, R. I.
Electric Controller & Mfg. Co., The..... Cleveland, Ohio.	V. V. Fittings Co..... 3 Philadelphia. (See Baker-Joslyn Co.).
Faries Mfg. Co..... Decatur, Ill.	Wagner Electric Manufacturing Co..... St. Louis, Mo.
Federal Sign System (Electric)..... 8 618 Mission St., San Francisco.	Western Electric Co..... 11 Eighth and Santee Sts., Los Angeles; 1900 Telegraph Ave., Oakland, Cal.; 680 Folsom St., San Francisco; 84 Marion St., Seattle; 45 North Fifth St., Portland, Ore.
General Electric Co.....24-26-27 724 So. Spring St., Los Angeles; Worcester Bldg., Port- land; Rialto Bldg., San Francisco; Colman Bldg., Seattle; Paulsen Bldg., Spokane.	Ward-Leonard Electric Co..... Mt. Vernon, New York.
Garland & Affolter Engineering Co..... 28 Rialto Building, San Francisco.	Westinghouse Electric & Manufacturing Co.....13-14 50-52 East Broadway, Butte; Van Nuys Bldg., Los Angeles; Couch Bldg., Portland; 212 So. W. Temple, Salt Lake City; First National Bank Bldg., San Fran- cisco; Second and Cherry Sts., Seattle; Paulsen Bldg., Spokane.
Habirshaw Electric Cable Co., Inc..... 10 (See Western Electric Company.)	Westinghouse Lamp Co..... 12 (See Westinghouse Electric & Manufacturing Co.)
Hemingray Glass Co..... 20 236-240 So. Los Angeles St., Los Angeles; 345 Oak St., Portland; 807 Mission St., San Francisco.	Western Pipe & Steel Co..... 444 Market St., San Francisco; 1758 North Broadway, Los Angeles.
Howell Electric Motors Co..... 28 Howell, Mich.; Rialto Bldg., San Francisco.	Weston Electrical Instrument Co..... 109 Weston Ave., Newark, N. J.; Frank E. Smith, 682 Mission St., San Francisco.
Hubbard & Co..... 22 (See Pacific States Elec. Co.)	Youngstown Sheet & Tube Co..... 10 Youngstown, Ohio. (See Electric Agencies Co.)
Hotpoint Electric Co..... Ontario, Cal.	
Hurley Machine Co..... 21 New York and Chicago. (See Pacific States Electric Co.)	
Landers, Frary & Clark..... 150 Post St., San Francisco, and all jobbers.	
Locke Insulator Manufacturing Co..... 9 (See Pierson, Roeding & Co.)	
Moloney Electric Co..... St. Louis, Mo.; Rialto Bldg., San Francisco.	



